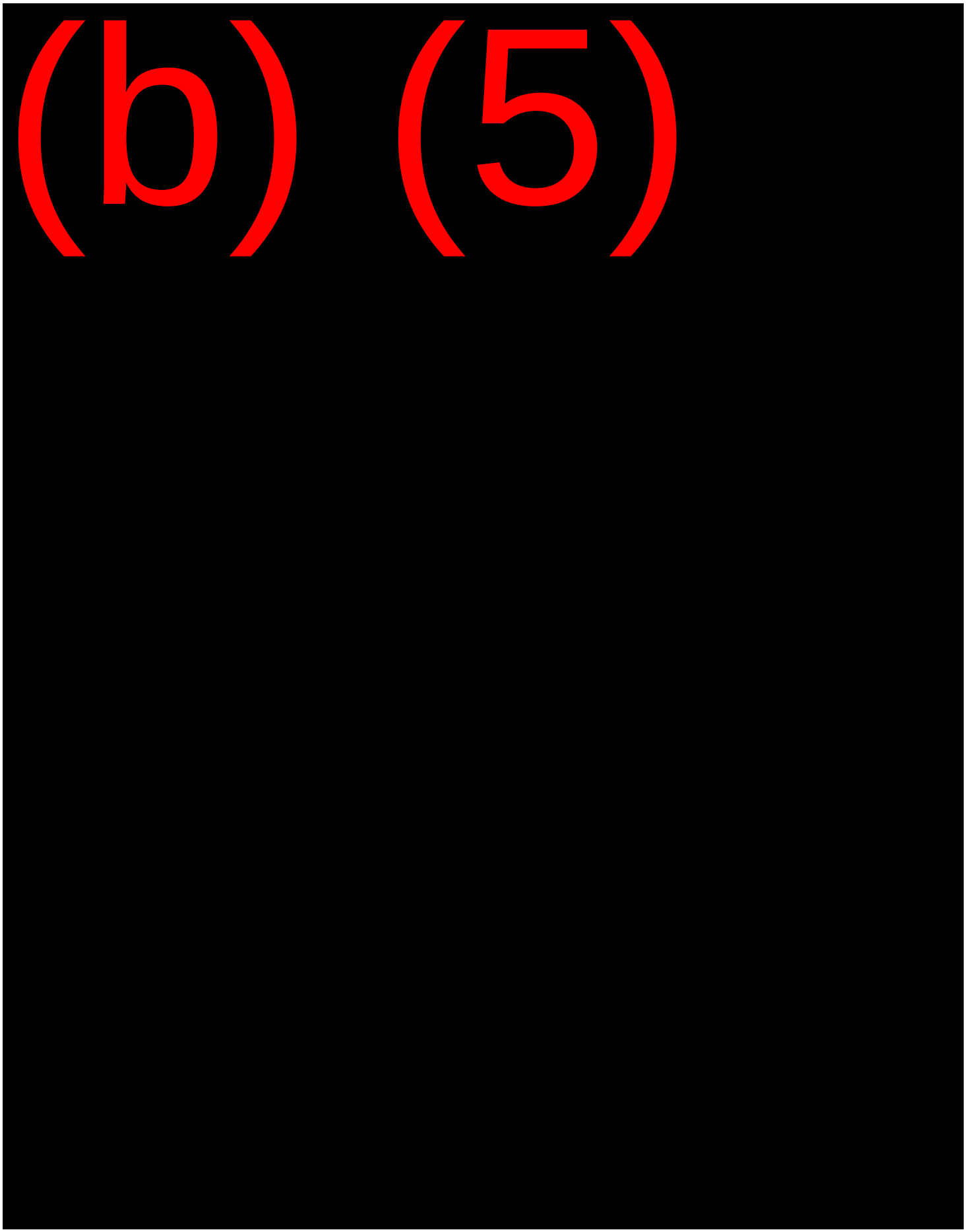
```
library(readr)
library(dplyr)
library(ggplot2)
library(plotly)
# library(htmlwidgets)


root_dir <-
  "//v18h1n-eggfs/rtp_eggxd_frd$/ERODRI01/Desktop/06.14.2021 Subpart OO who would
get AIM allowances exercise/Final data work in excel/"

#load the data
# df <- read_csv(file.path(root_dir, "master file as of 9.27.2021 1042 AM.csv"))
df <- readr::read_csv("//v18h1n-eggfs/rtp_eggxd_frd$/ERODRI01/Desktop/06.14.2021
Subpart OO who would get AIM allowances exercise/Final data work in excel/master
file as of 9.27.2021 1042 AM.csv")

# drop NA values
df <- df[!is.na(df$`Reporting Year`),]
# drop 2010 data
df <- df[df$`Reporting Year` > 2010,]
# keep only data on AIM HFCs
df <- df[df$`F-GHG Group` == "Kigali HFCs",]

# list variable names
names(df)

# replace any spaces in the variable names with underscores
names(df) <- gsub(" ", "_", names(df))

# load data about parent companies and who is getting allowances
entities <- read_csv("//v18h1n-eggfs/rtp_eggxd_frd$/ERODRI01/Desktop/06.14.2021
Subpart OO who would get AIM allowances exercise/Final data work in excel/parent
company list as of 10.1.2021 1011 AM.csv")
# entities <- readr::read_csv(file.path(root_dir, "parent company list as of
10.1.2021 1011 AM.csv"))
# subset to companies getting allowances and take fewer columns
entities <-
  entities[!is.na(entities$`getting_general_pool_allowances?`),
           c("eGGRT_facility_id", "pete_version_of_allowance_recipient",
"getting_general_pool_allowances?")]

# merge the tables together
df <- merge(df, entities,
            by.x = "e-GGRT_Facility_ID",
            by.y = "eGGRT_facility_id",
```

```
            all.x = T)
# drop companies that aren't getting allowances
df <- df[!is.na(df$`getting_general_pool_allowances?`),]

# drop columns we won't use
df <-
  df %>%
  dplyr::select("e-GGRT_Facility_ID", "Reporting_Year", "Facility_Name",
                "Chemical", "F-GHG_Group", "GWP",
                "Production_(MT_CO2e)_[416(a)(1)]",
                "Imports_(MT_CO2e)_[416(c)(1)]",
                "Exports_(MT_CO2e)_[416(d)(1)]",
                "On-site_Transformation_(MT_CO2e)_[416(a)(2)]",
                "On-site_Destruction_(MT_CO2e)_[416(a)(3)_and_416(c)(8)]",
                "Destruction_of_previously_produced_(MT_CO2e)",
                "pete_version_of_allowance_recipient",
                "getting_general_pool_allowances?")

# add on off-site trans/dest that we'll actually count
# load data
offsite <- read_csv(file.path(root_dir, "offsite final 9.24.2021.csv"))
# merge onto main dataframe
df <- merge(df, offsite,
            by.x=c("e-GGRT_Facility_ID", "Reporting_Year" ),
            by.y=c("facility_id", "year"),
            all.x=T)
# remove duplicate offsite values, so we just have 1 value per facility-year
df <-
  df %>%
  dplyr::group_by(Reporting_Year, `e-GGRT_Facility_ID`) %>%
  mutate(temp_rank = rank(amount_to_subtract_MTCO2e, ties.method = 'first')) %>%
  ungroup()
df$amount_to_subtract_MTCO2e[df$temp_rank >1] <- NA
df <- df %>% select(-temp_rank)

#make sure everything is numeric
numeric_cols <- c("Production_(MT_CO2e)_[416(a)(1)]",
                  "Imports_(MT_CO2e)_[416(c)(1)]",
                  "Exports_(MT_CO2e)_[416(d)(1)]",
                  "On-site_Transformation_(MT_CO2e)_[416(a)(2)]",
                  "On-site_Destruction_(MT_CO2e)_[416(a)(3)_and_416(c)(8)]",
                  "Destruction_of_previously_produced_(MT_CO2e)")
df[numeric_cols] <- sapply(df[numeric_cols], as.numeric)

# aggregate the facility-year-chemical level data up into allowance_recipient-year
level data
df_grouped <-
  df %>%
  dplyr::group_by(Reporting_Year, pete_version_of_allowance_recipient) %>%
  dplyr::summarise(prod = sum(`Production_(MT_CO2e)_[416(a)(1)]`, na.rm=T),
```

```
                  imports = sum(`Imports_(MT_CO2e)_[416(c)(1)]`, na.rm=T),

                  exports = sum(`Exports_(MT_CO2e)_[416(d)(1)]`, na.rm=T),

                  onsite_trans =
sum(`On-site_Transformation_(MT_CO2e)_[416(a)(2)]`, na.rm=T),
                  onsite_dest =
sum(`On-site_Destruction_(MT_CO2e)_[416(a)(3)_and_416(c)(8)]`, na.rm=T),
                  offsite_dest_trans = sum(amount_to_subtract_MTCO2e, na.rm=T),
                  .groups = 'keep')

# calculate AIM consumption
df_grouped$aim_cons <-
  df_grouped$prod +
  df_grouped$imports -
  df_grouped$exports -
  df_grouped$onsite_trans -
  df_grouped$onsite_dest -
  df_grouped$offsite_dest_trans

# calculate AIM production
df_grouped$aim_prod <-
  df_grouped$prod -
  df_grouped$onsite_trans -
  df_grouped$onsite_dest -
  df_grouped$offsite_dest_trans

# remove 2020 data
df_grouped <- df_grouped[df_grouped$Reporting_Year < 2020,]


# rank the years in terms of AIM productions and consumption
df_3_highest <-
  df_grouped %>%
  dplyr::group_by(pete_version_of_allowance_recipient) %>%
  dplyr::mutate(cons_rank = rank(desc(aim_cons), ties.method = 'first'),
                prod_rank = rank(desc(aim_prod), ties.method = 'first'))

# get the average of the top 3 years, omitting any zero values (consumption)
final_cons_df <-
  df_3_highest %>%
  dplyr::filter(cons_rank <= 3) %>%
  dplyr::filter(aim_cons > 0) %>%
  dplyr::group_by(pete_version_of_allowance_recipient) %>%
  summarize(avg_top_3_cons = mean(aim_cons, na.rm=T)) %>%
  dplyr::mutate(sum_of_highest_values=sum(avg_top_3_cons)) %>%
  dplyr::mutate(share_of_allowances = avg_top_3_cons / sum_of_highest_values)

# get the average of the top 3 years, omitting an zero values (production)
final_prod_df <-
```

```
  df_3_highest %>%
  dplyr::filter(prod_rank <= 3) %>%
  dplyr::filter(aim_prod > 0) %>%
  dplyr::group_by(pete_version_of_allowance_recipient) %>%
  summarize(avg_top_3_prod = mean(aim_prod, na.rm=T)) %>%
  dplyr::mutate(sum_of_highest_values=sum(avg_top_3_prod)) %>%
  dplyr::mutate(share_of_allowances = avg_top_3_prod / sum_of_highest_values)


write.csv(x = final_prod_df %>% select(-sum_of_highest_values),
          file = paste(file.path(root_dir,
                                 "AIM allowances interactive graphics"),
                                 "/production data",  Sys.Date(), ".csv",
                       sep=""),
                                 row.names=F)
write.csv(x = final_cons_df,
          file = paste(file.path(root_dir,
                                        "AIM allowances interactive graphics"),
                       "/consumption data", Sys.Date(), ".csv",
                       sep=""),
          row.names=F)
```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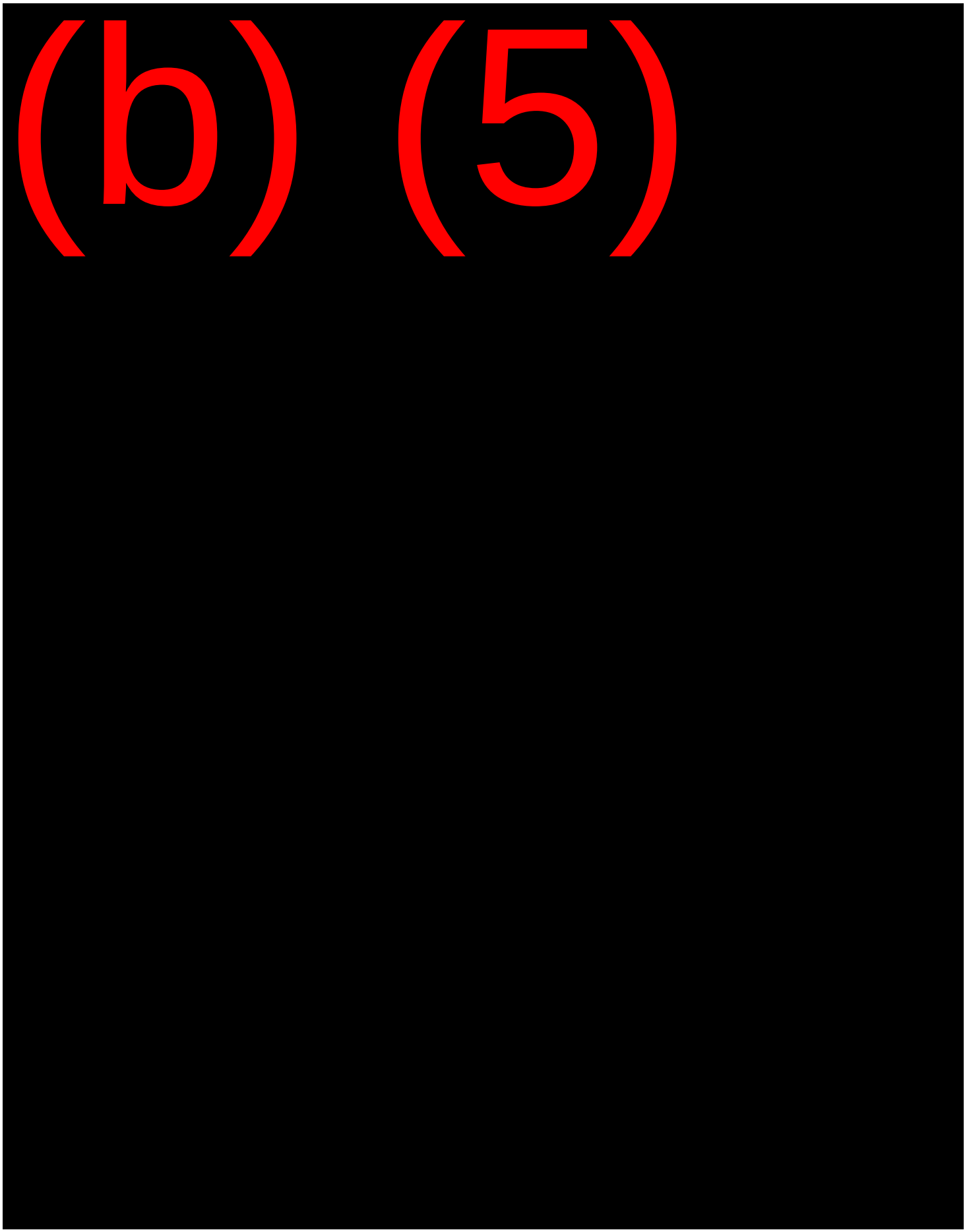
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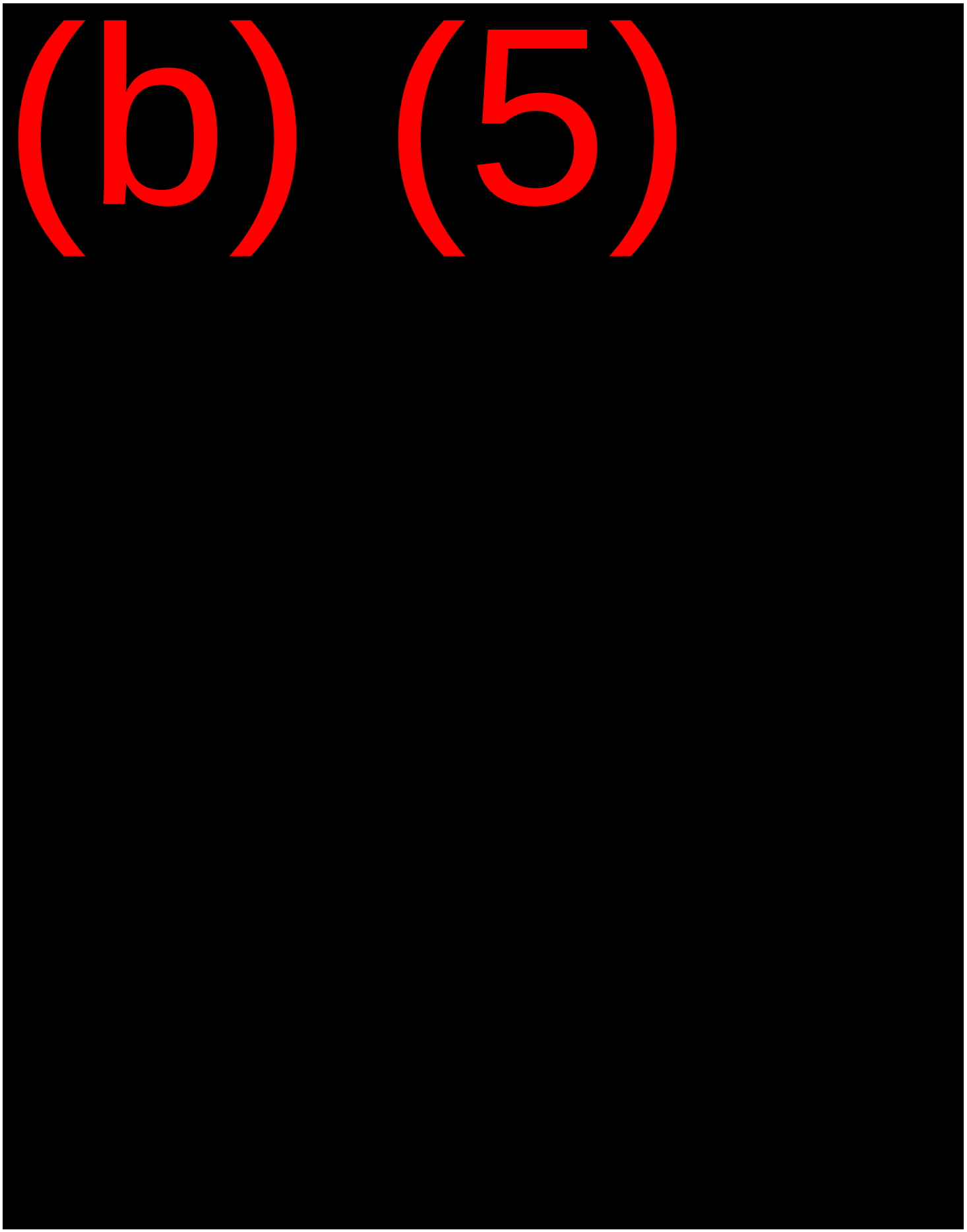
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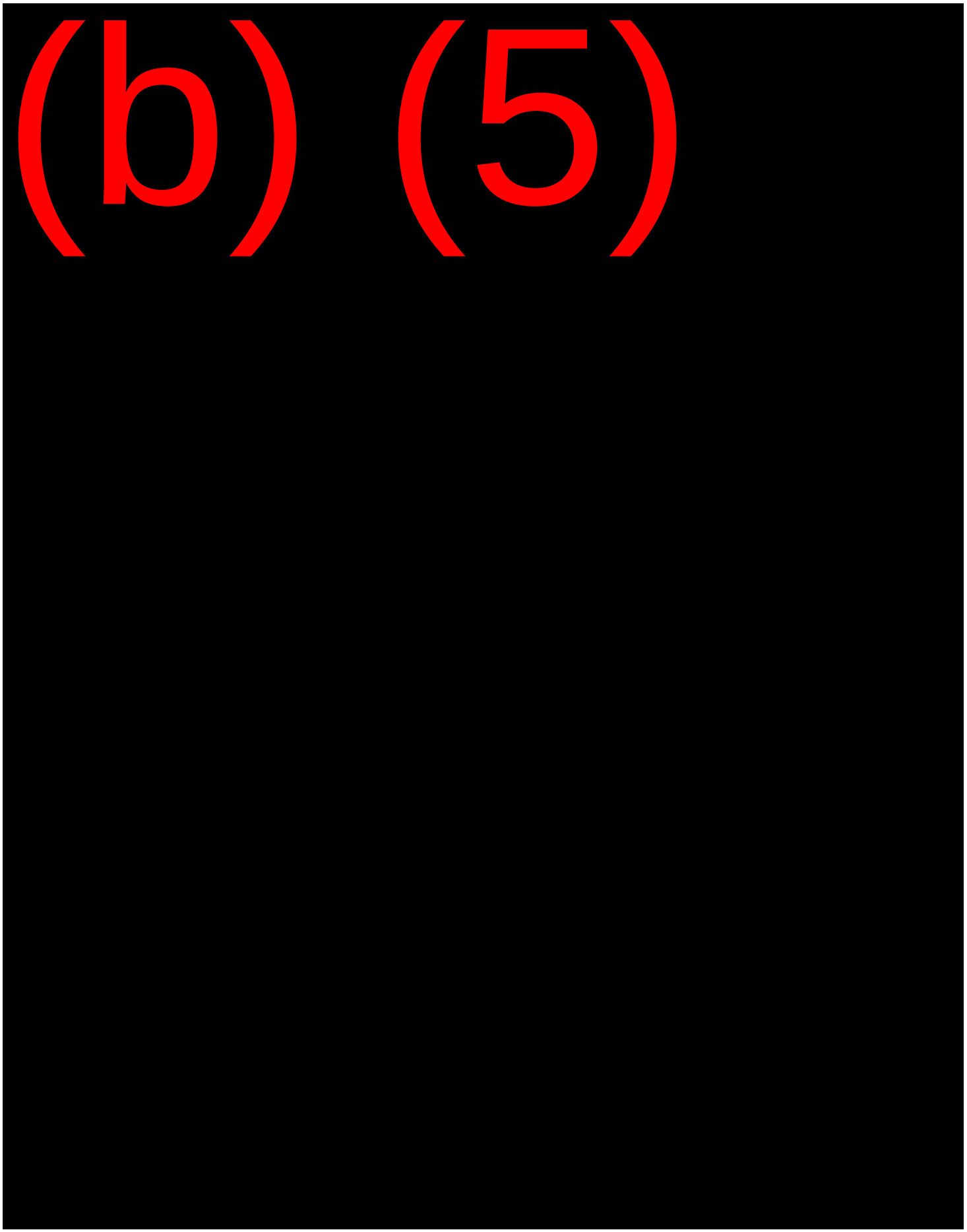
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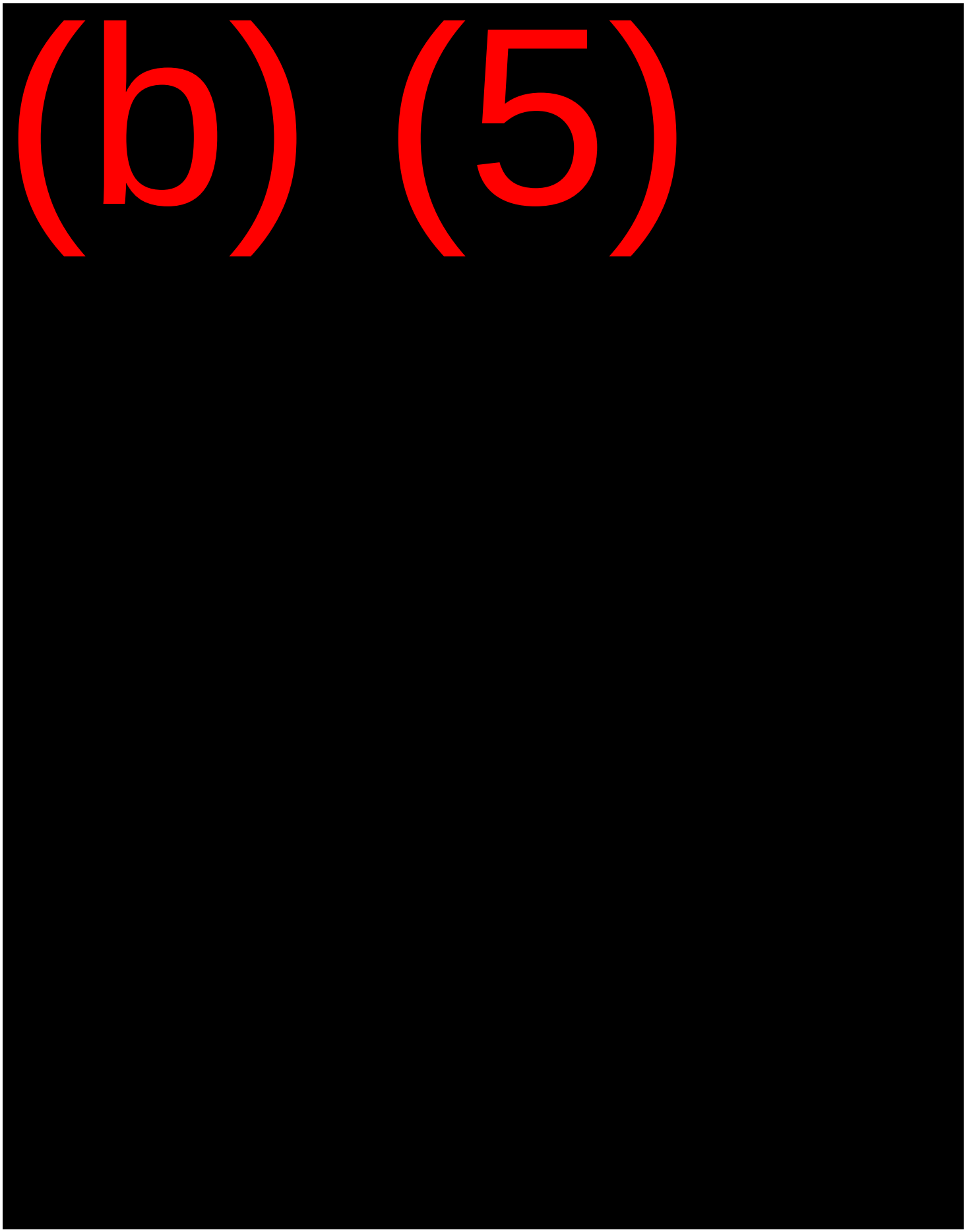
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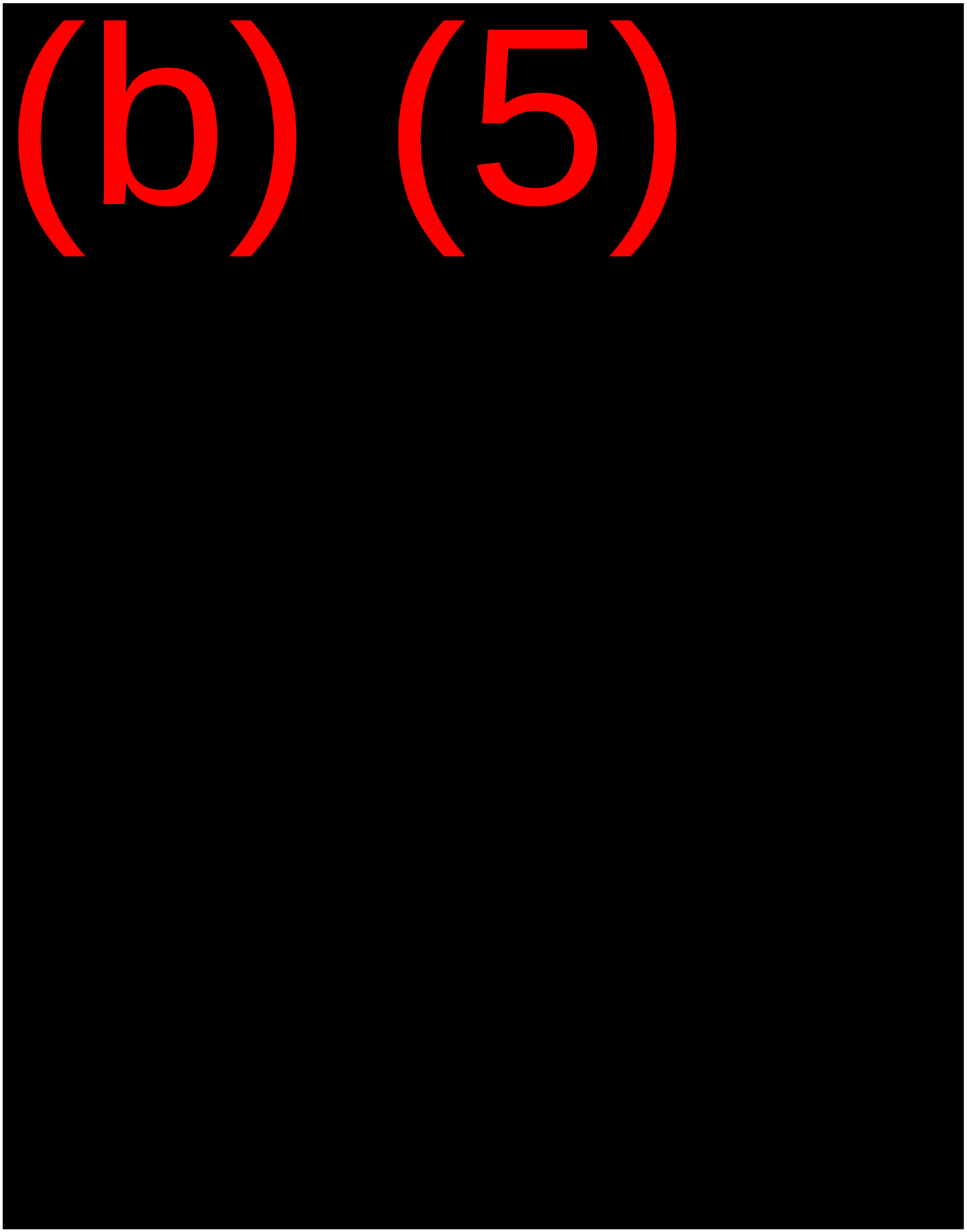
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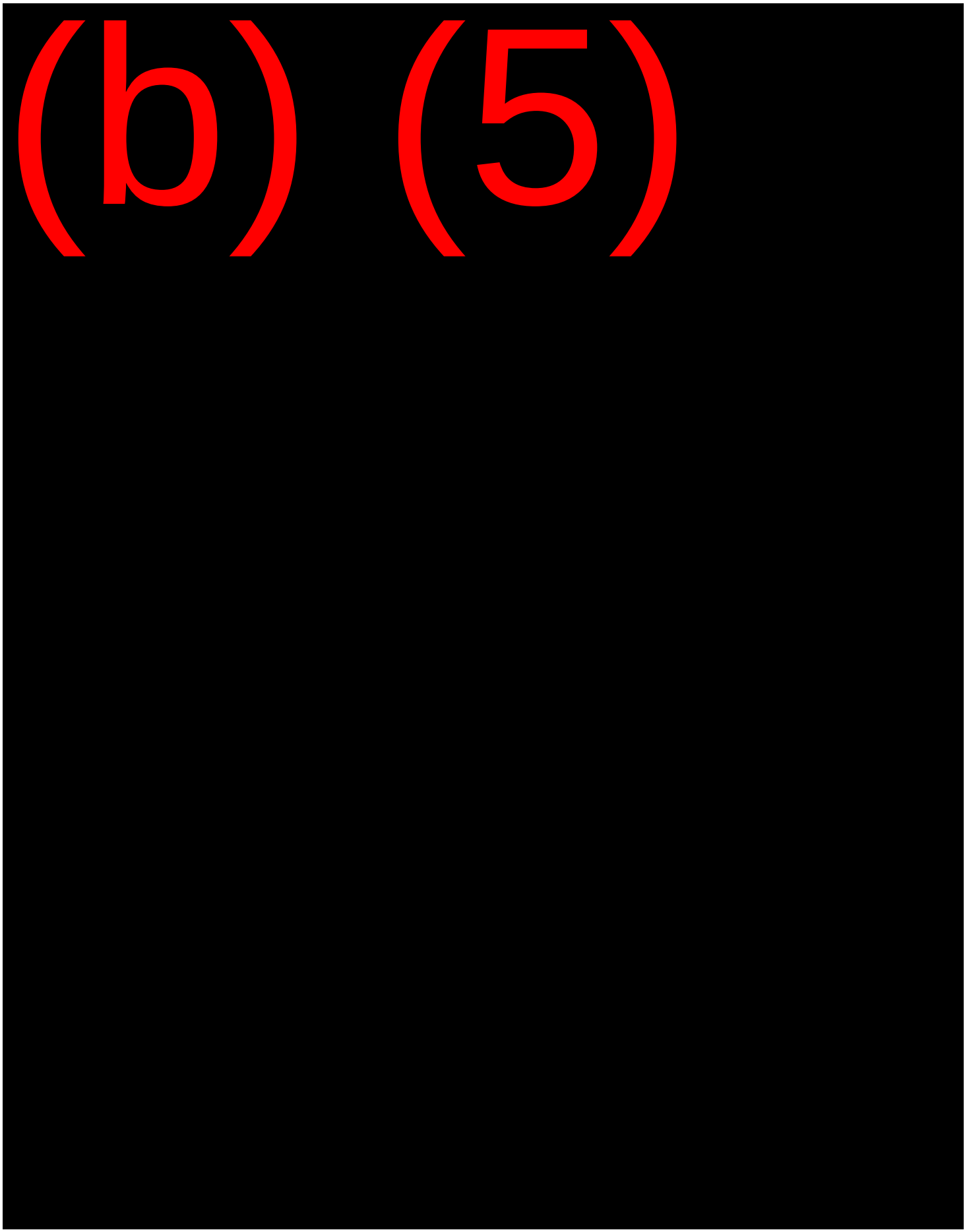

(b) (5)

MEMORANDUM

Date: October 1, 2021

SUBJECT: Methodology for Allocating Application-specific Allowances for 2022

FROM: Cynthia A. Newberg, Director
Stratospheric Protection Division

TO: The file

Purpose

To document EPA's decision making regarding application-specific HFC allowances for calendar year 2022 under 40 CFR part 84, subpart A.

Background

EPA conducted significant outreach to identify entities that may be eligible for application-specific allowances. EPA released a Notice of Data Availability (NODA) on February 11, 2021 (86 FR 9059). As part of the docket to the NODA that preceded this rule, EPA released reports characterizing the Agency's understanding of the market for five of the six applications.

EPA held a number of stakeholder meetings to gather feedback while developing the proposal, including a general stakeholder meeting with more than 200 participants on February 25, 2021, and five sector-specific workshops on March 11 and March 12. In addition, EPA held another sector workshop on April 26. While developing the proposal, EPA also held more than 60 individual meetings with interested companies, associations, and environmental and public health organizations, as well as federal agencies (e.g., SBA, DoD, State, Commerce, NASA, FDA, CBP), and States (e.g., California Air Resources Board, U.S. Climate Alliance). This information was used to update the market characterizations initially released with the NODA.

EPA contacted entities understood to be end users in the applications listed under subsection (e)(4)(B)(iv) of the AIM Act. These entities were asked to submit a questionnaire detailing their annual HFC usage accompanied by supporting documentation such as paid invoices or sales receipts to verify the quantities of each HFC purchased and date of purchase. Entities had the option of requesting additional application-specific allowances beyond what would be allocated based on their historic usage and growth rate for unique "individual circumstances." To support such a request, entities were required to submit further supporting documentation.

More than 170 interested parties provided written or oral comments. After publication of the proposed rulemaking in the *Federal Register*, EPA held more than 70 additional meetings with interested companies, associations, and environmental and public health organizations, as well as federal agencies and States.

EPA updated the market characterizations for the final rule based on stakeholder feedback and data.

Regarding the process for determining 2022 allowances, EPA stated the following in the final rule signed September 23, 2021:

> For the initial 2022 application-specific allocations, EPA is finalizing the following approach to issuing application-specific allowances to companies: for companies that experienced positive growth based on their submitted data from 2018 to 2020, the Agency will (1) calculate a company's growth rate from 2018–2019; (2) calculate a company's growth rate from 2019–2020; (3) average the growth rates calculated from steps 1 and 2; (4) multiply the average growth rate by the company's 2020 purchases of EVe-weighted regulated substances for application-specific use to determine an estimated level of allowance need for 2021; and (5) multiply the estimated level of 2021 need by the average growth rate to estimate need for 2022. The number calculated in step 5 will generally be used to allocate application-specific allowances to a company for 2022. EPA determined a company's historic HFC usage based on responses to EPA information requests, invoices, sales records, GHGRP reporting, supplier data, and other information available to the Agency. This amount was used to estimate both the growth rate and 2020 purchases of regulated substances for each company. For companies that experienced negative average annual growth based on their submitted data from 2018 to 2020, in an application that also experienced a negative growth rate, the Agency will allocate allowances equal to the highest quantity of HFCs on an EVe-weighted-basis reported over the three years. EPA also took into account information provided on individual circumstances (e.g., public health emergency). EPA will use this approach for 2022 because the Agency recognizes that 2020 was an unusual year given economic disruptions due to the global pandemic.

Methodology

1. In order to calculate application-specific allowance quantities for each entity, EPA looked to verified data. Specifically, EPA considered data verified based on submitted consumption data, invoices, shipping documentation, purchase orders, purchase receipts, goods receipts, sales data, or units/quantities received from manufacturers or suppliers plus the amount of HFCs in each unit of that product (e.g., the number of MDIs acquired in a given year multiplied by the average quantity and type of HFC in each unit).

2. Next, EPA converted the HFCs in kg to exchange value-weighted quantities and calculated sums of annual verified quantities for each entity and across applications.

3. Then, EPA calculated application-wide average annual growth rates (AAGRs) based on verified data in 2018 through 2020. In order to do this, first EPA removed chemical-specific HFC data from application-wide totals for entities where supporting documentation for their data was not provided or was incomplete (e.g., an entity was only able to provide some of its invoices in a given year).[1] If EPA confirmed that an entity purchased zero HFCs, the zero value was kept in the application-wide totals (e.g., (b) (4)).

EPA then summed all exchange value-weighted HFC quantities by application for each year. In order to calculate an application-wide AAGR, EPA used the following formula:

[1] Inclusion of data that was incomplete would skew the average annual growth rates by creating the appearance of an artificially low number in one year—resulting in a higher growth rate than was actually realized.

- (([2019 HFC purchases]/[2018 HFC purchases])-1)+([2020 HFC purchases]/[2019 HFC purchases])-1))/2

4. Next, EPA used the following formula to calculate entity-specific average annual growth rates for each entity with validated data for 2018, 2019, and 2020:

- (([2019 HFC purchases]/[2018 HFC purchases])-1)+([2020 HFC purchases]/[2019 HFC purchases])-1))/2

For entities that failed to provide supporting documentation for all three years, whether fully or partially, based on comparisons to the information they submitted in their questionnaire or from correspondence, EPA applied the application's AAGR between 2018-2020 to the 2020 purchase value.

For entities that were missing data or provided incomplete data in any year, EPA applied the application's AAGR between 2018-2020 to the 2020 verified value. Additionally, if EPA verified that a company had zero HFCs in any year for all HFCs, the Agency was unable to calculate an entity-specific growth rate for them using the above formula (i.e., a growth rate cannot be calculated when there is a zero in the denominator).

5. To determine an individual entity's allocation, EPA generally multiplied the entity's 2020 data by the higher of the entity's average annual growth rate or the application's average annual growth rate, after squaring that growth rate to account for two years of growth (between 2020 and 2022).

If a company was only able to provide data for 2020, EPA multiplied their 2020 HFC purchases by the square of the application AAGR.

If the average annual growth rate was negative for an entity and for the application, EPA allocated allowances equal to the highest quantity of HFCs reported over the three years between 2018-2020. EPA applied the same approach to a company that did not provide supporting documentation for HFC purchases for 2020 or 2018, but provided an explanation that they continue to use HFCs and purchase HFCs irregularly (e.g., every other year).

6. As described in the final rule, EPA also considered individual circumstances that may merit an increased allocation beyond historical growth rates if sufficiently documented. In this allocation, EPA considered the following circumstances as meriting additional allowances:

- Demonstrated increases in manufacturing projected for the next calendar year; or
- The acquisition of another domestic manufacturer or its manufacturing facility or facilities.

Some entities requested allowances additional to their historic growth rate because of new manufacturing plants or expanded manufacturing lines scheduled to come online within the next calendar year. In such situations, EPA requested projections of quantities of additional HFCs needed by month and estimated start dates. EPA required that entities provide sufficient documentation to show this increased manufacturing capacity, and accepted documentation such as news articles and building permits.

Similarly, some MDI manufacturers requested additional allowances for new products that they expect to produce in 2022 beyond what would be calculated from historic growth rates. While entities noted

the COVID-19 pandemic increased the demand for MDIs, none requested additional allowances explicitly for that reason.

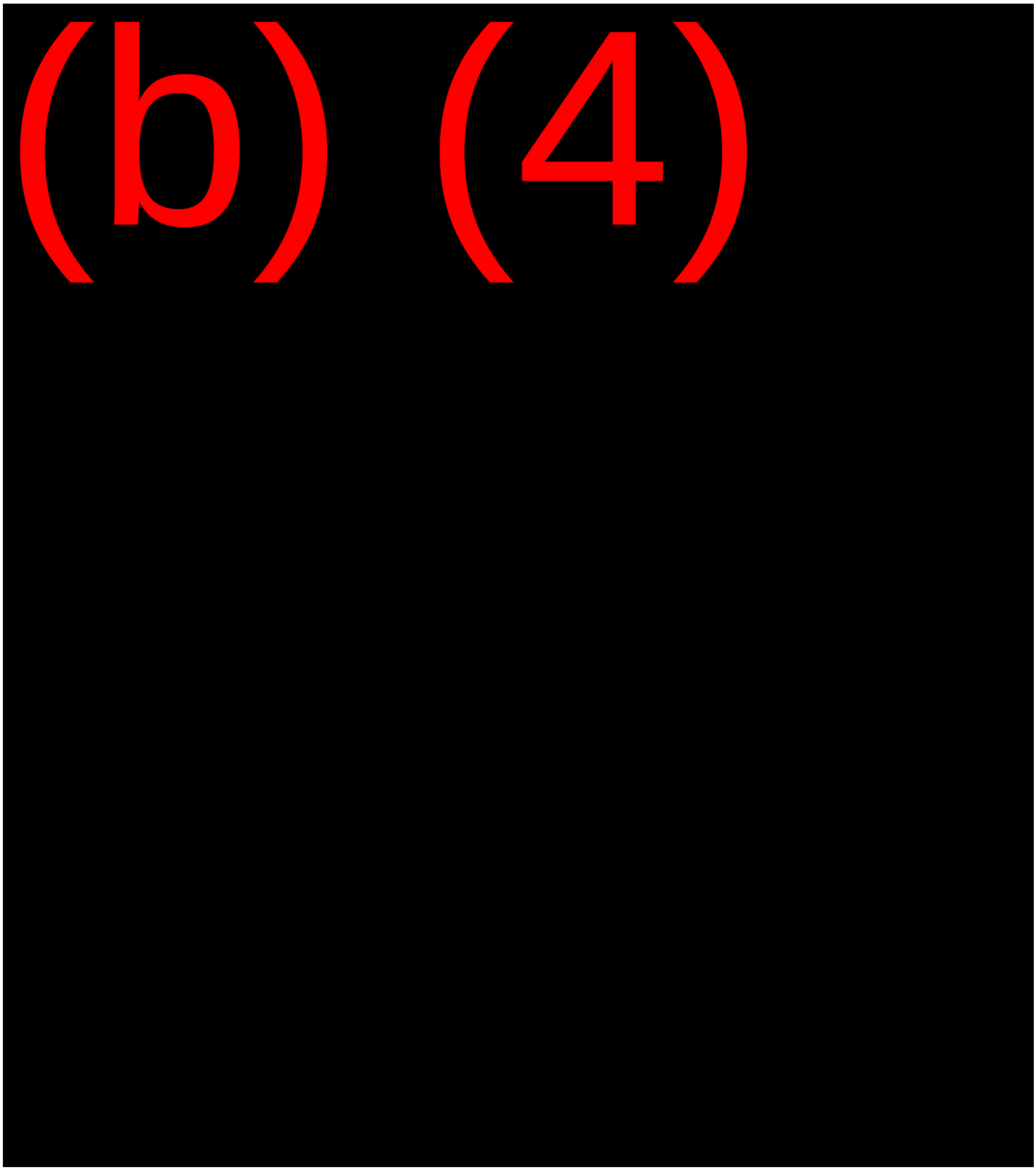
For entities that made an allowance level request based on acquiring another entity, EPA accepted supporting documentation such as an SEC 8-K filing and confirmed with the acquired entity that all of its manufacturing facilities had been acquired. EPA relied on data from the acquired entity to determine allowances that were allocated to the current owner.

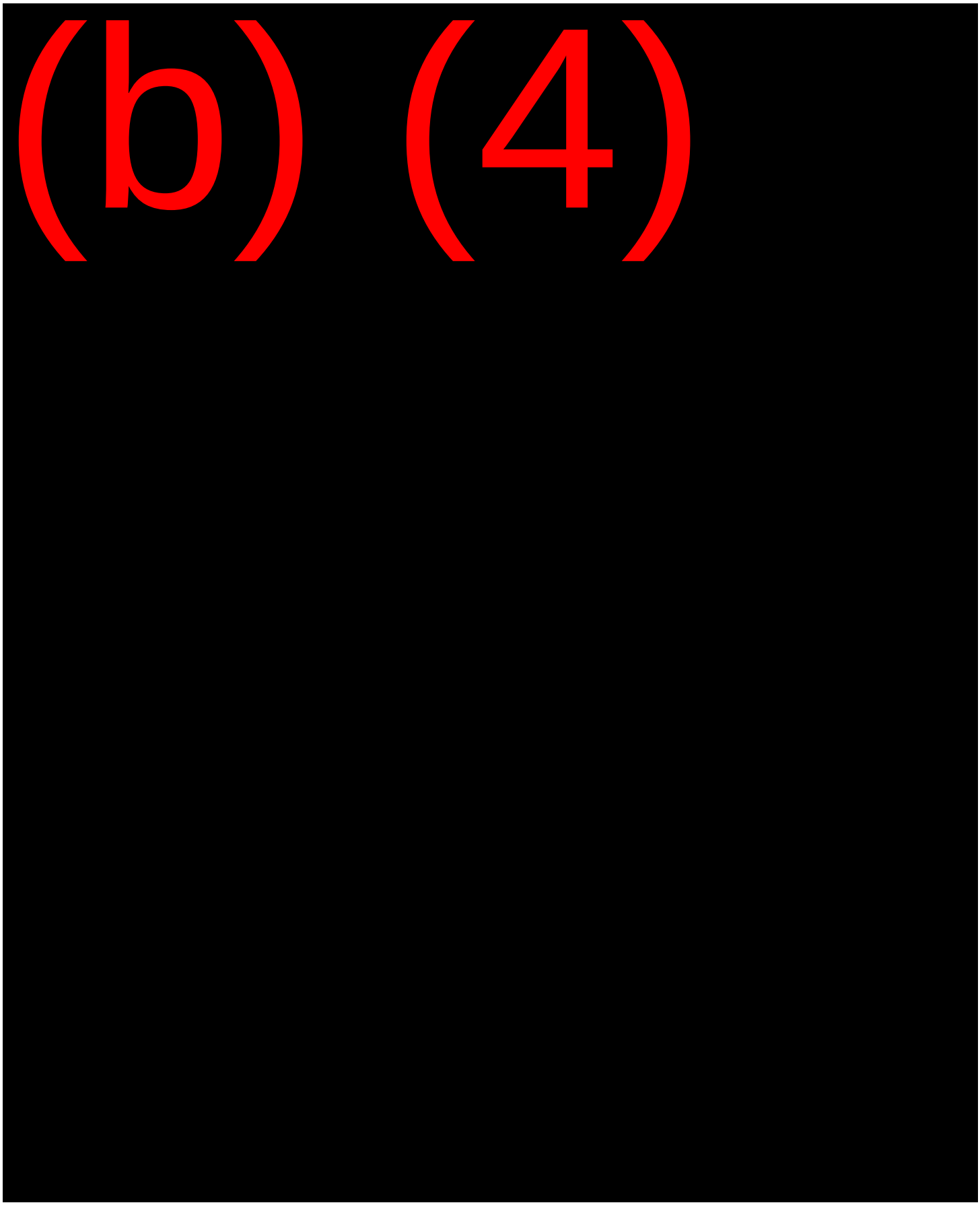
7. For final allowance calculations, EPA did the following:

- For entities requesting additional allowances due to the construction of a new facility or manufacturing capacity, EPA calculated an allocation based on average growth rate, as outlined in Steps 2, 3, and 4, and added additional allowances to account for new construction if verified.
- For entities requesting additional allowances for new products that they expect to produce in 2022, EPA added to quantities calculated in steps 2, 3, and 4 based on their requests in the same manner as reviewing data on new manufacturing capacity.
- For entities requesting additional allowances due to the acquisition of another entity that also submitted data, EPA combined their values from Step 2 before calculating their AAGRs.
- For all other entities, EPA calculated final quantities as outlined in Step 5.
- EPA did not include entities that do not use HFCs in one of the applications included in subsection (e)(4)(B)(iv).

Entity-specific approaches

The following section contains a breakdown of the process EPA took to calculate application-specific allowances for each entity and contains data that may be claimed as CBI.

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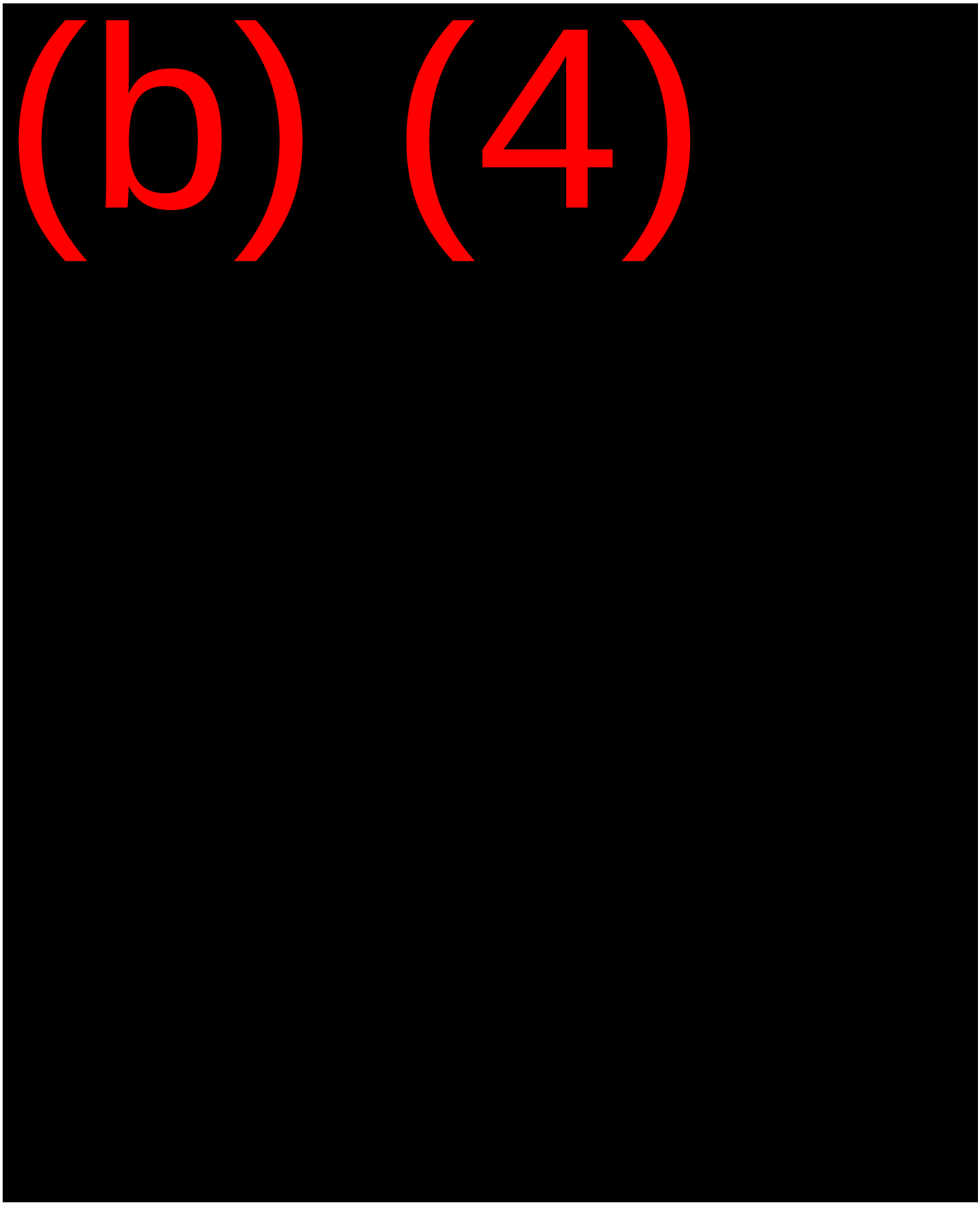
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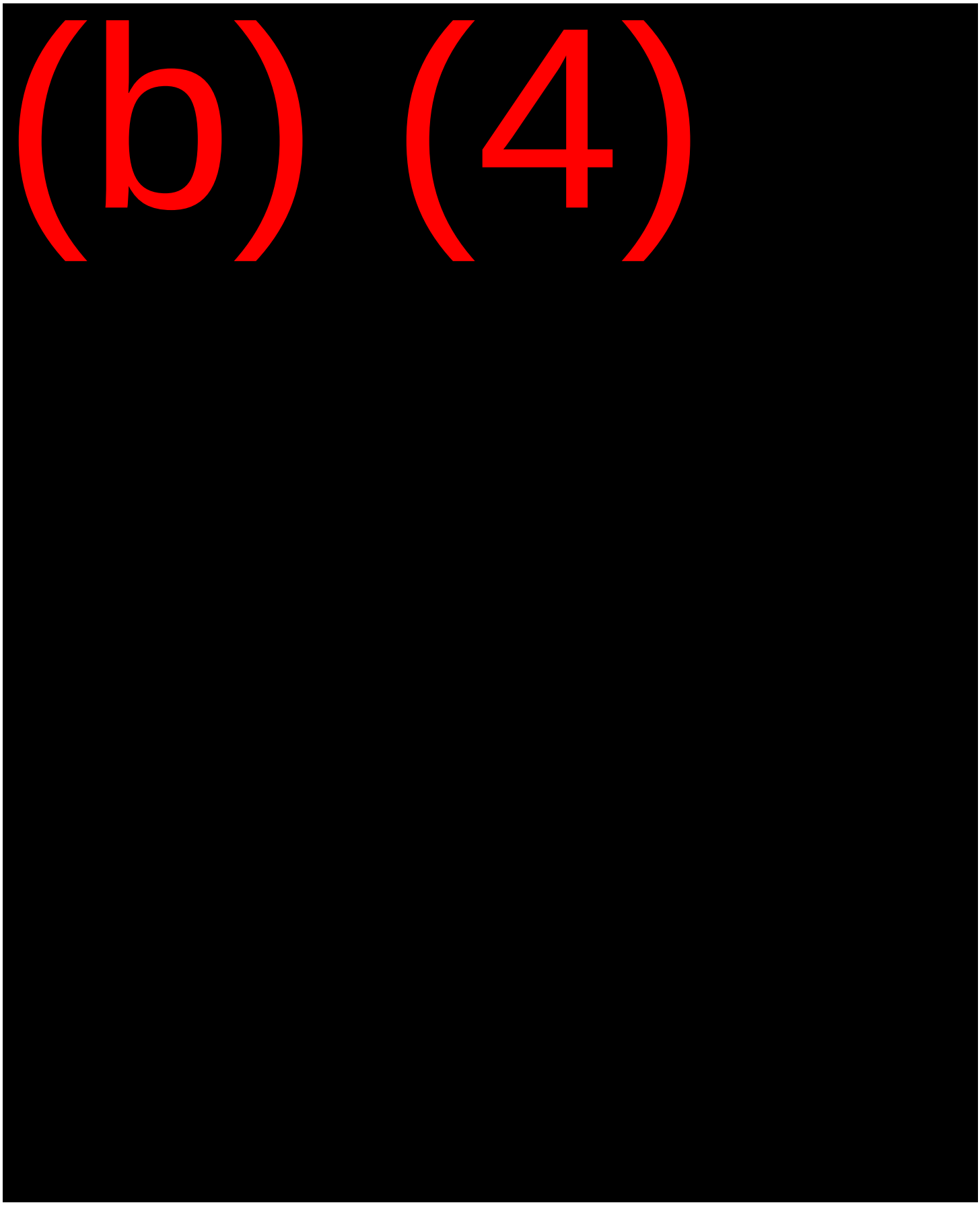
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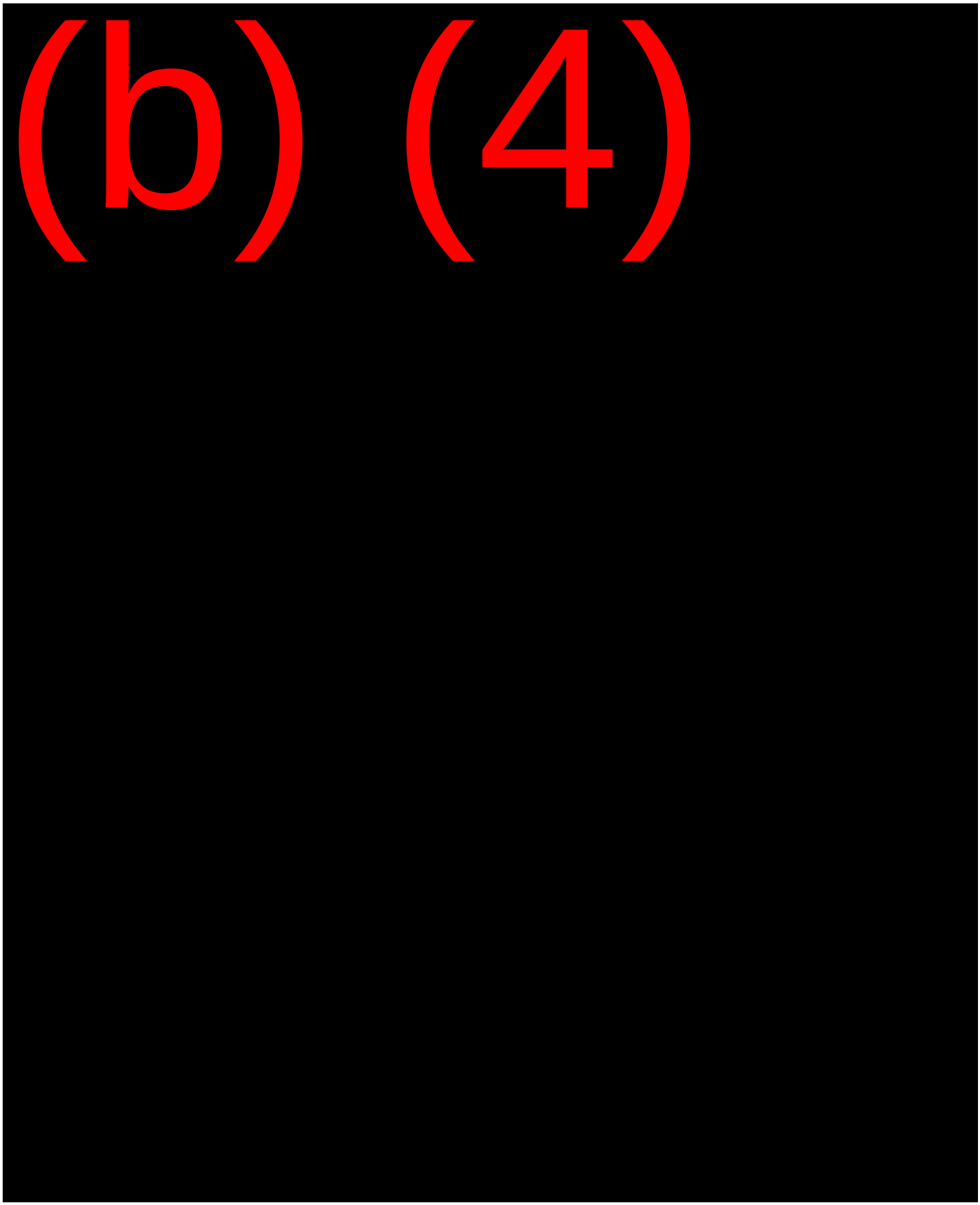
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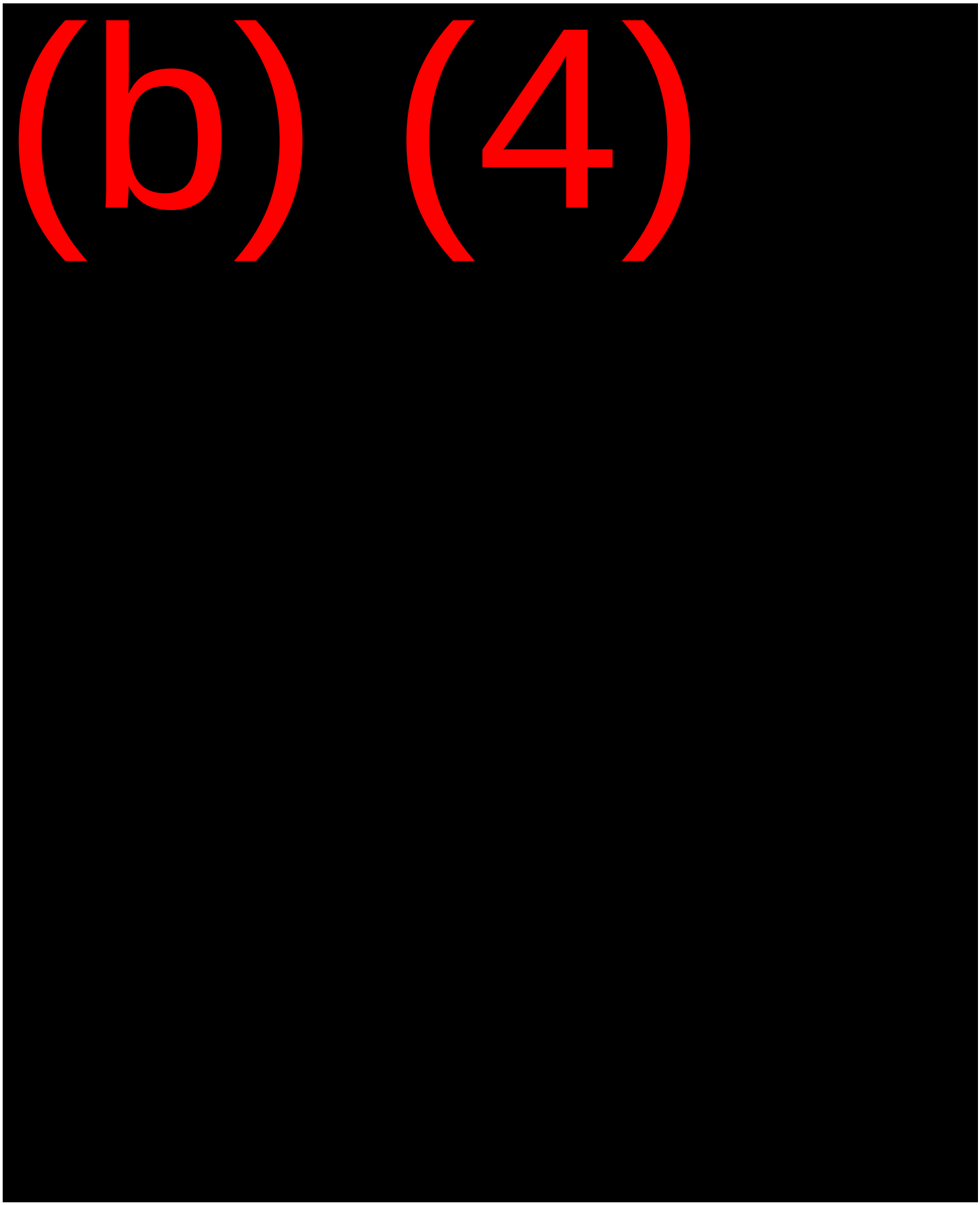

(b) (4)


(b) (4)

MEMORANDUM

Date: October 1, 2021

SUBJECT: Methodology for Allocating General Pool Allowances for 2022: How EPA collected and verified the data underpinning the individual entity allocations for general allowances (i.e., not application-specific and not set aside pool)

FROM: Cynthia A. Newberg, Director
Stratospheric Protection Division

TO: The file

Purpose

To document EPA's decision making regarding general pool HFC allowances for calendar year 2022 under 40 CFR part 84, subpart A.

Steps

Step 1: Pull data reported to EPA's Greenhouse Gas Reporting Program (GHGRP)

- Under Subpart OO of the Greenhouse Gas Reporting Program (GHGRP), facilities[1] that import, export, or destroy more than 25,000 metric tons of carbon dioxide equivalent annually in fluorinated greenhouse gases, and all those that produce or transform fluorinated greenhouse gases, are required to submit annual reports to EPA detailing this activity. Facilities upload these annual reports using EPA's "electronic Greenhouse Gas Reporting Tool," or e-GGRT.
- Data that are submitted under Subpart OO in e-GGRT undergo a variety of verification checks during and after report submission. Many of these checks are automatic, built into the reporting forms themselves. These checks look for potential errors by flagging things such as new or missing chemicals, large or small outliers in reported chemical quantities, or unexpected changes in facility activity from the prior year. Facilities are sent messages about potential errors in their report; they can either reply, explaining the unusual values, or they can resubmit their report to correct any errors.

Step 2: Compare import data submitted to GHGRP to import data from U.S. Customs and Border Protection.

- Import data for all facilities that reported in 2020 and had not previously reported to e-GGRT were compared to Customs records. [2]
- For any facility that reported data to e-GGRT between 2011 and 2019, the three highest years of import data were compared to Customs records. If the sum of metric tons of HFCs reported to e-GGRT was at least 20% greater than the sum of metric tons of imports under HFC-related HTS codes in customs, these submissions were flagged for possible issues. Generally speaking, there were almost no exact matches between e-GGRT data and the Customs data. There is only one

[1] EPA uses the term "facility" throughout this document to refer to the business unit reporting to GHGRP.
[2] As further explained in the later section on outcomes for specific entities, EPA did not fully verify one of three years of data for one facility, (b) (4) , before allowances were distributed.

HTS code that is unique to a single HFC (HFC-134a). All the other HFCs are then grouped into a few other HTS codes and, depending on the year, all blends have one or two codes. There was significant variability in how importers classified their imports under different HTS codes. Overall, a 20% difference served as a cutoff for messaging facilities that looked like they might have noteworthy errors.

Step 3: Facility outreach for facilities flagged as having potential issues after comparing GHGRP and Customs data

- The Designated Representative or Alternate Designated Representative for each facility that was flagged during the comparison of GHGRP and Customs' data was sent a message, in the correspondence tracking system in e-GGRT and sometimes individually (via email and phone), requesting that they either:
  1. Provide documentation (bills of lading, invoices, and/or U.S. Customs Entry Forms) substantiating their imports if the company argued data available in GHGRP was correct, or
  2. Resubmit their report to GHGRP to correct potential errors that would account for why the reported GHGRP data did not more closely align with data available in the US Customs database.
- Of the 23 facilities that were sent messages about their reported data, eight resubmitted e-GGRT reports to correct errors and/or submitted Customs documentation. The remaining 15 submitted Customs documentation that verified their reported imports.
- Contractors and EPA staff reviewed resubmitted reports and supporting documentation. Any issues found in the documentation review resulted in additional messages sent to the facility.
- (b) (4) [redacted]

Step 4: EPA maintains a compilation file (the "master sheet") with all facility-level, chemical-specific data for production, destruction, transformation, import and export under Subpart OO. This ensures EPA staff can conduct data analysis on a single sheet, rather than opening scores of raw e-GGRT reports. This master sheet was updated to reflect the new data and corrected data submitted to GHGRP in steps 1 through 3 above.

Step 5: Quality assurance of the AIM-related data in EPA's master sheet

- Every AIM-related data element in the master sheet relevant to allocation decisions was manually checked by EPA staff and contractors to ensure that the chemical-specific quantities in the master spreadsheet reflected the Subpart OO report most recently submitted to e-GGRT. Each entry was manually verified at least once, with a selection of these entries verified multiple times.[3] [4]

[3] Note that EPA's Subpart OO master sheet contains data that is not directly relevant to EPA's HFC phasedown rule, including data from reporting year 2010, and data concerning chemicals like nitrogen trifluoride or sulfur hexafluoride. This data was not checked as part of EPA's preparation of the AIM-related data.

[4] Due to the lead time required to run the calculations associated with EPA's regulatory impact analysis for the HFC phasedown rule, EPA had to quality assure the baseline (2011-2013) data before all the years of data could be quality assured. EPA staff manually checked every record in reporting years 2011, 2012, and 2013 in the master sheet against the corresponding records in each facility's most recently submitted e-GGRT reports. EPA staff found

Step 6: Group related e-GGRT facilities into single entities where appropriate consistent with EPA's final regulations[5]

- Some entities have ownership over multiple production, transformation or destruction facilities that are required to report to e-GGRT individually. These facilities were grouped together with the controlling entity. Although imports and exports are required to be reported at the corporate level, several companies had acquired, spun-off or merged with other entities over time, leaving records from multiple facilities applying to just one potential allowance holder.
- In e-GGRT, each facility has a reported "parent company" and a reported "owner." Those data fields were EPA's starting place in determining facility ownership. Where EPA determined there were potential issues surrounding the reported ownership of one or multiple e-GGRT facilities, facility owners were contacted to verify ownership. EPA also referred to comments submitted by stakeholders, web research, and the Dun & Bradstreet's Hoovers corporate database. Where EPA staff has sufficient evidence that facilities were under "shared corporate or common ownership or control," the data for the relevant facilities were grouped together into one entity. Generally, allowances were issued under the facility names in e-GGRT. In cases where an entity owned multiple e-GGRT facilities, the relevant parent company name was generally used. In other cases, facilities were related but not under a corporate parent; in these cases, EPA generally used the name preferred by the common owner.
- If an entity had a facility that had a domestic address and/or point of contact and a facility with a foreign address and/or point of contact, EPA allocated to the domestic facility to help ensure effective communication and, if needed, enforcement.

Step 7: Review requests for "special consideration" for entities that did not import in 2020, but wanted to receive allowances based on historic activity.

- If an entity did not import in 2020, general pool allowances were generally not allocated based on historic activity. However, entities were able to request special consideration, and EPA reviewed all such requests. EPA reviewed these entities' historical HFC imports in e-GGRT and held meetings with the relevant stakeholders. If EPA could determine that the entity was still active in the market, EPA allocated allowances. Reasons for determinations on individual companies are documented later in this memorandum.

Step 8: Determine which entities are eligible for allowances

- EPA then identified the entities that were eligible for allowances based on the conditions set in the Final Rule. Entities that produced and imported and entities that imported more (in EVe terms) than they exported, transformed, and/or destroyed were eligible for production and/or consumption allowances. Entities that did not have 2020 imports or production, and did not receive "special consideration," were filtered out of the dataset. Entities that did not have imports or production in 2011-2019, or had production and imports that were less than the amount exported, transformed, and/or destroyed, were also filtered out of the dataset. In other

several errors in the master sheet (e.g. missing data) that they corrected manually in the baseline total. The most recent calculations are in the e-GGRT General Document Library, in a file called "RY2010-2020+Master+List_BASELINE_UPDATE_8.30.2021.xlsx"

[5] EPA is using "entity" in this document to refer to facilities or associated collections of facilities that were considered for allowances. As explained in the final rule, EPA is treating all companies majority owned and/or controlled by the same individual(s) as a single company, even if there is no corporate parent. All facilities under common ownership were grouped together as one entity.

words, companies who had negative calculated levels of production or consumption in all years were not issued allowances.

Step 9: Calculate annual production for entities potentially receiving allowances

- For each entity potentially receiving allowances, EPA summed exchange values from the AIM HFCs master sheet for Production minus On-Site Destruction minus On-Site Transformation minus Off-Site Destruction minus Off-Site Transformation for each year between 2011 and 2019. Note that Off-Site Transformation and Off-Site Destruction were subtracted only if the quantity was sent to another facility that was not part of the same entity potentially being issued allowances as the sending facility, or if the receiving facility was part of an entity that was not eligible for allowances. This was to avoid counting transformation or destruction for the entity twice: once for the sending facility, and once for the receiving facility that transformed or destroyed the material.

Step 10: Calculate annual consumption for entities potentially receiving allowances

- For each entity potentially receiving allowances, EPA summed exchange values from the AIM HFCs master sheet for Production minus On-Site Destruction minus On-Site Transformation minus Off-Site Destruction (sent to a different entity) minus Off-Site Transformation (sent to a different entity) plus Imports minus Exports for each year between 2011 and 2019.
- For entities potentially receiving allowances that were associated with multiple facilities, yearly facility HFC activity was summed to get a year-by-year total of HFC production and consumption in MTEVe at the level of the entity.

Step 11: Determine average high three-year levels for each entity potentially receiving allowances

- EPA identified the three years with the highest production or consumption levels across 2011 through 2019 for each entity potentially receiving allowances—these years do not need to be consecutive. The highest years of production were identified separately from highest years of consumption (i.e., the three years need not match).
- The highest three years of production and consumption between 2011 and 2019 for every entity potentially receiving allowances were averaged to get a single pair of MTEVe values, one value for production and one for consumption.
- If an entity only had one or two years of HFC production or import, EPA took that one year or the average of those two years, respectively, rather than treating the missing year(s) of data as zero in the average calculation.

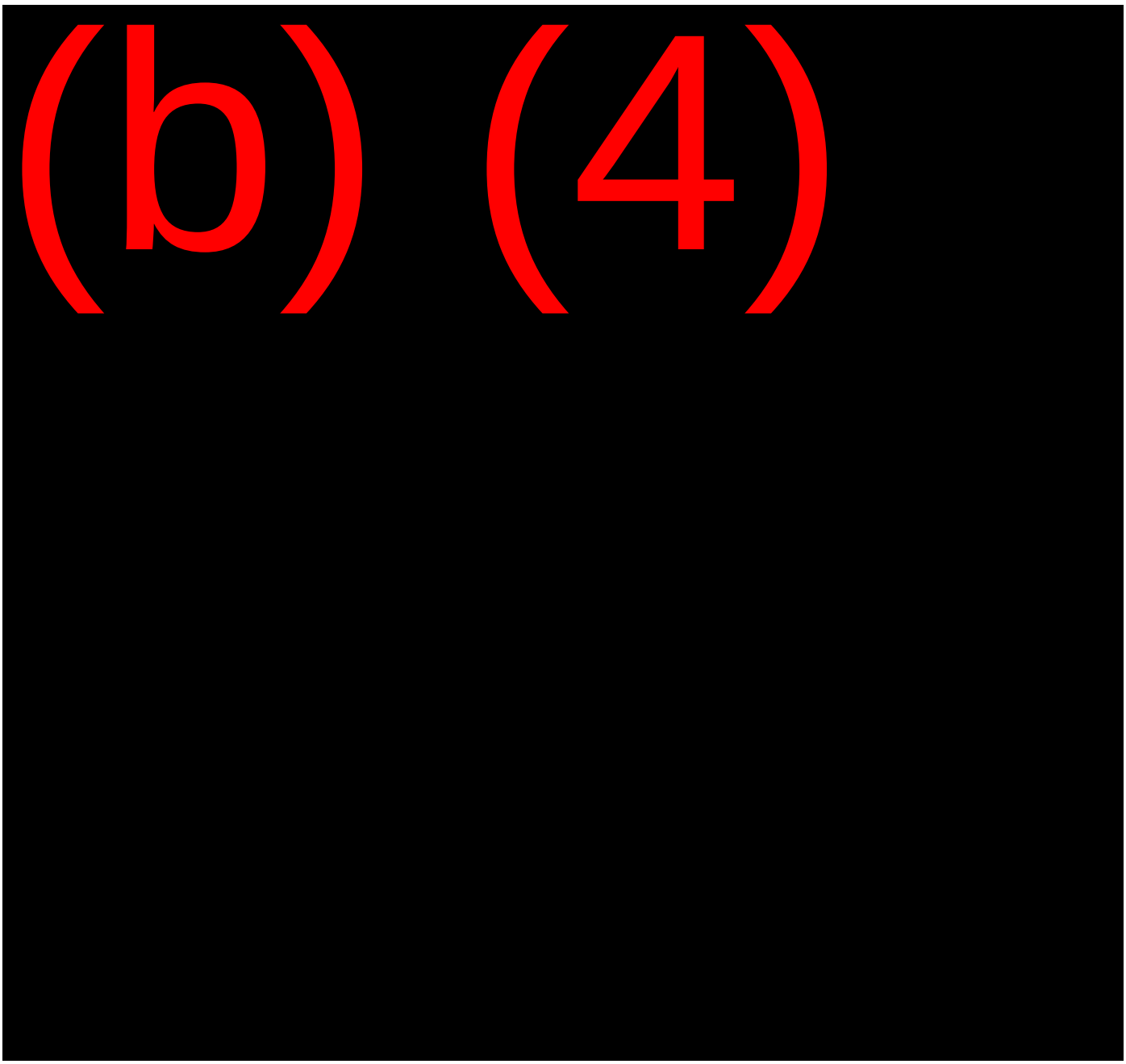
Step 12: Determine allocations for each entity

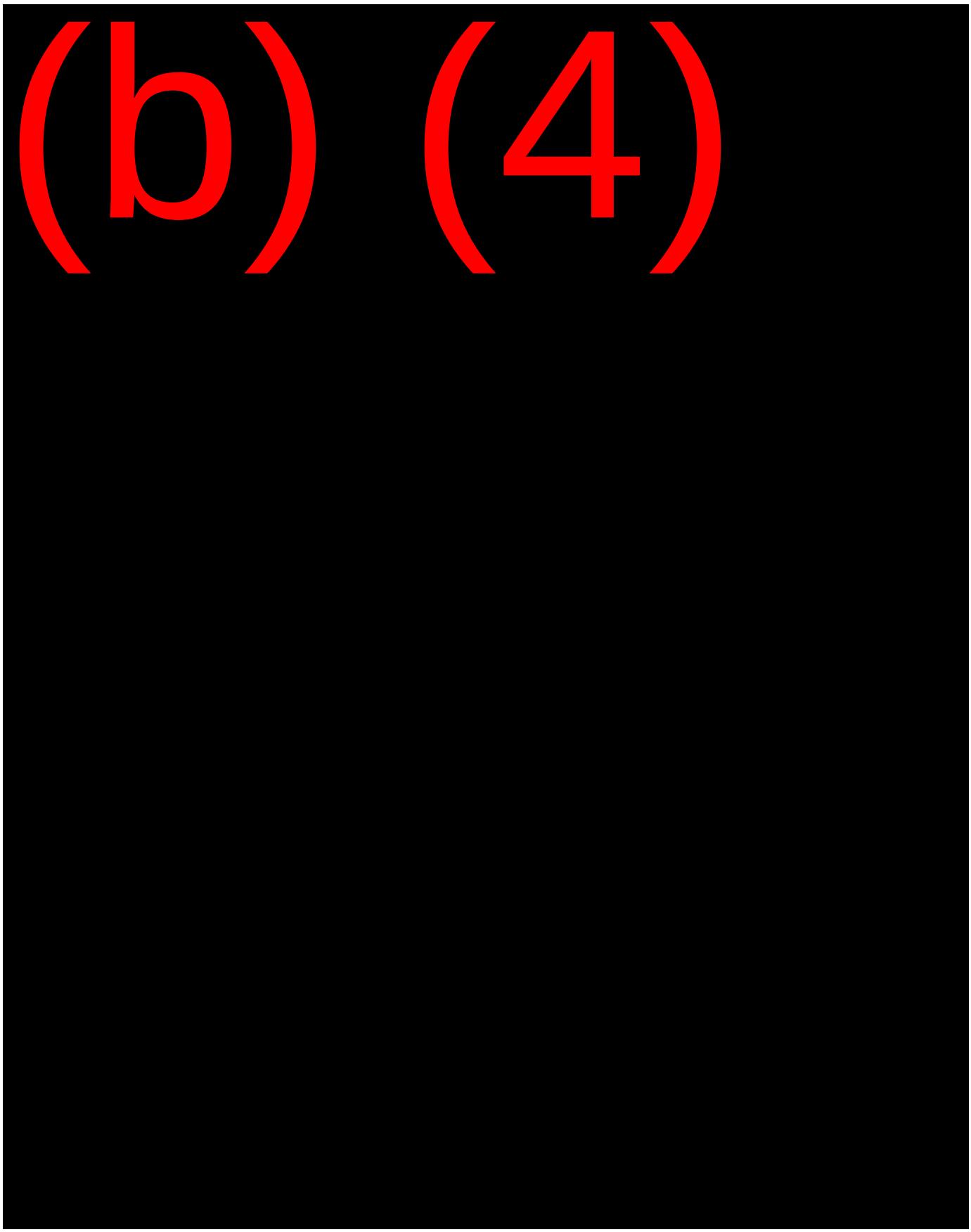
- All entity production averages were added together for an industry-wide production MTEVe total. The same was done for consumption averages to determine a consumption total. Each entity production or consumption average was divided by these industry-wide totals to determine a relative percentage. This percentage was then multiplied by the production or consumption baselines, less the set-aside and application-specific allowance amounts, to get entity-specific production and consumption allocations in MTEVe. Allocations were rounded to the one-tenth of a MTEVe after all calculations were completed.
- The entity level allowance calculations were performed separately by three different EPA employees, one using the R statistical programming language and two using Excel formulas. The

results of all three analyses were compared to ensure consistency. Additional spot checks were conducted to ensure the accuracy of the data.

- Due to rounding, the sum of the consumption allowances was slightly below the AIM consumption cap. In each case, the discrepancy was equivalent to less than a few kilograms of HFC-134a. EPA split the consumption allowance discrepancy equally among the consumption allowance recipients and added a fraction of an allowance to each recipient. The result was a series of individual allowance allocations that summed to the AIM production and consumption caps.

Outcomes for specific entities

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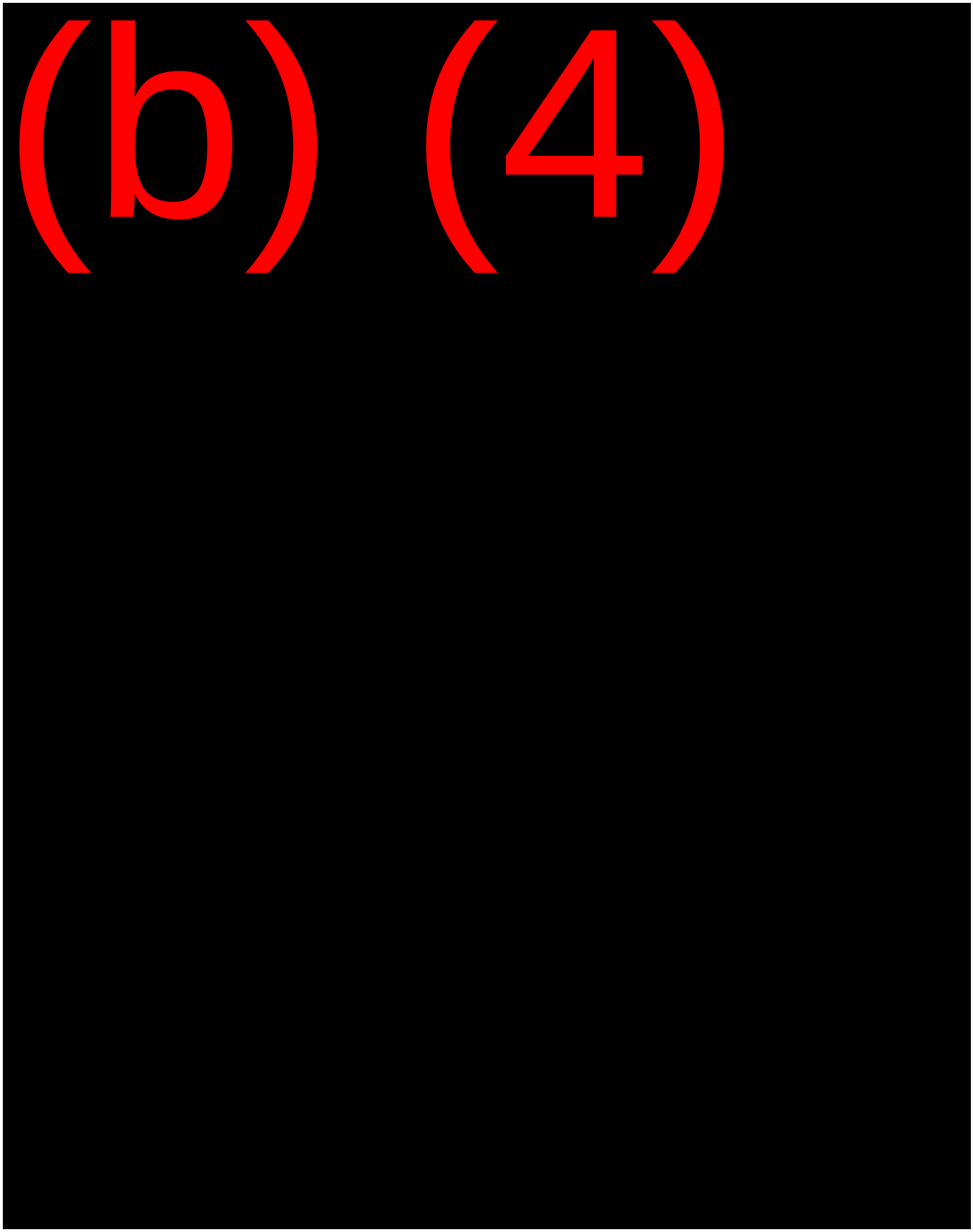
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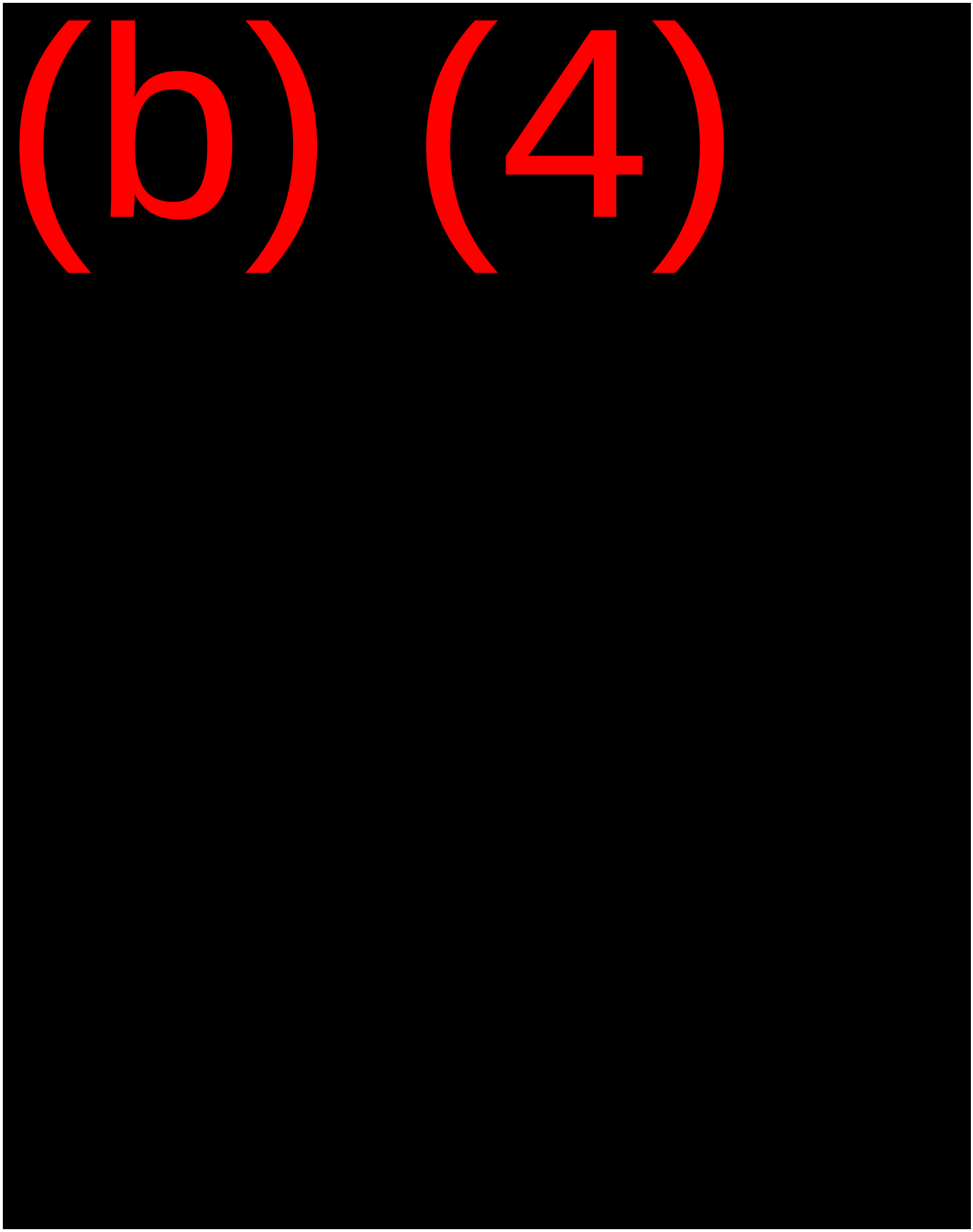
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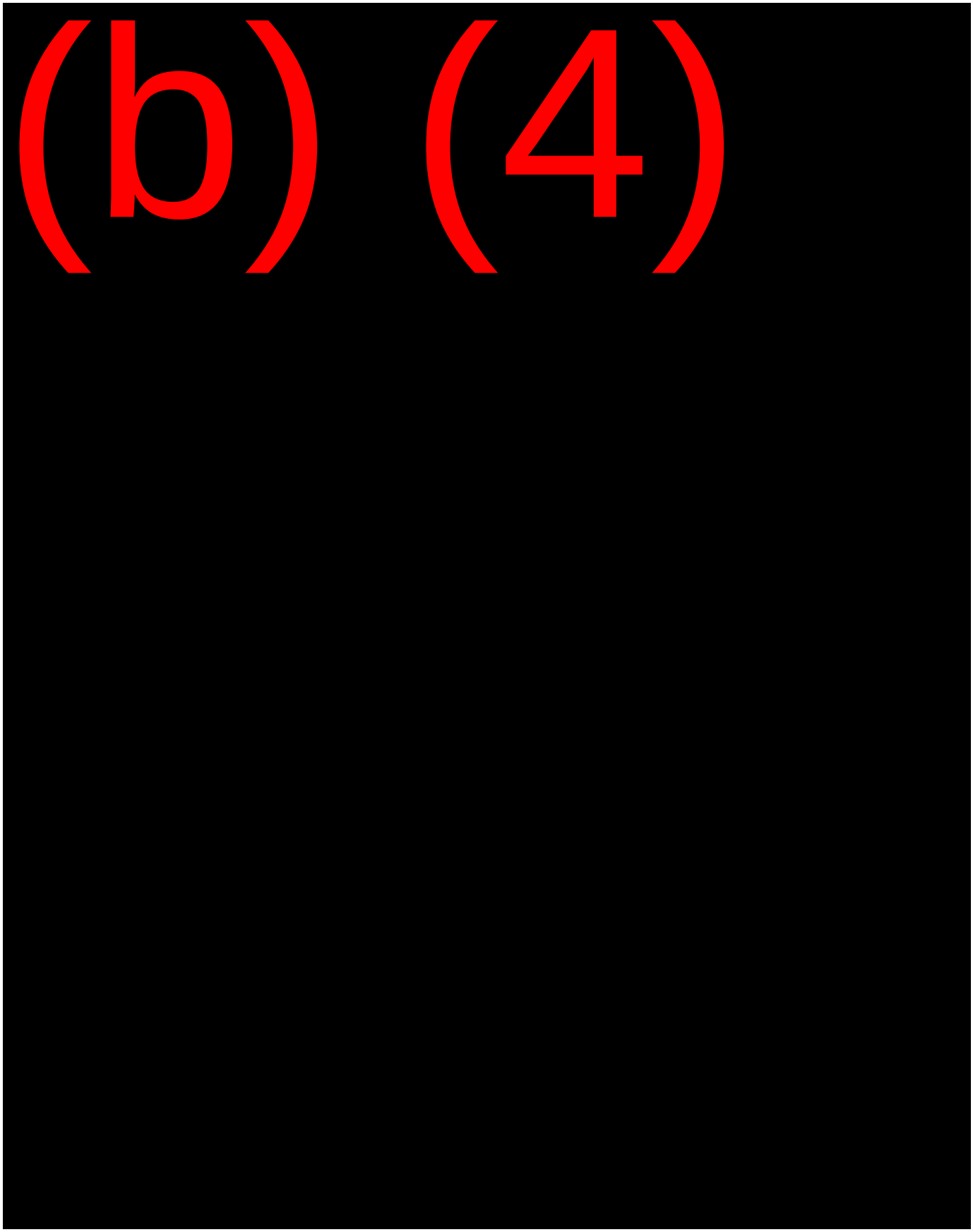
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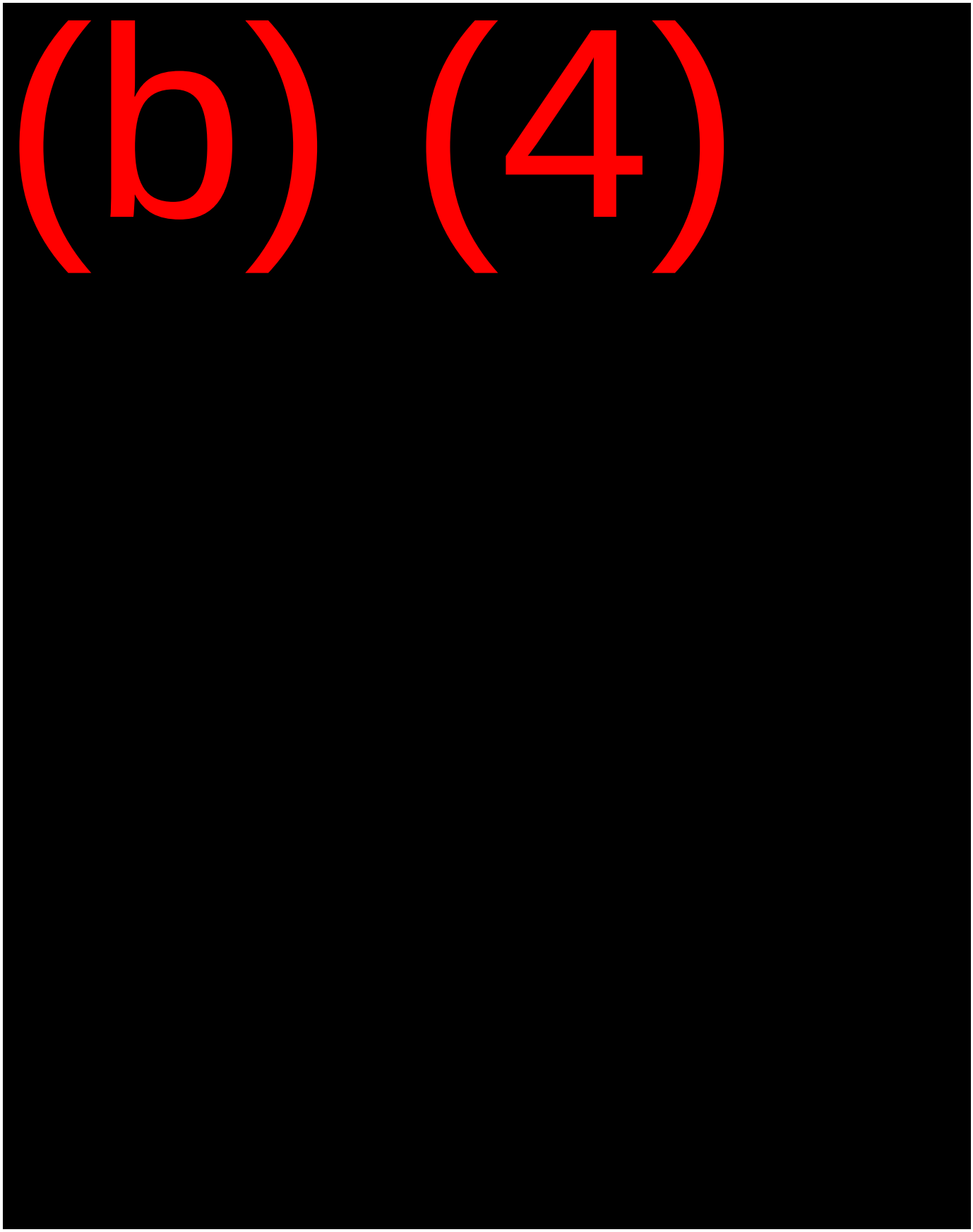
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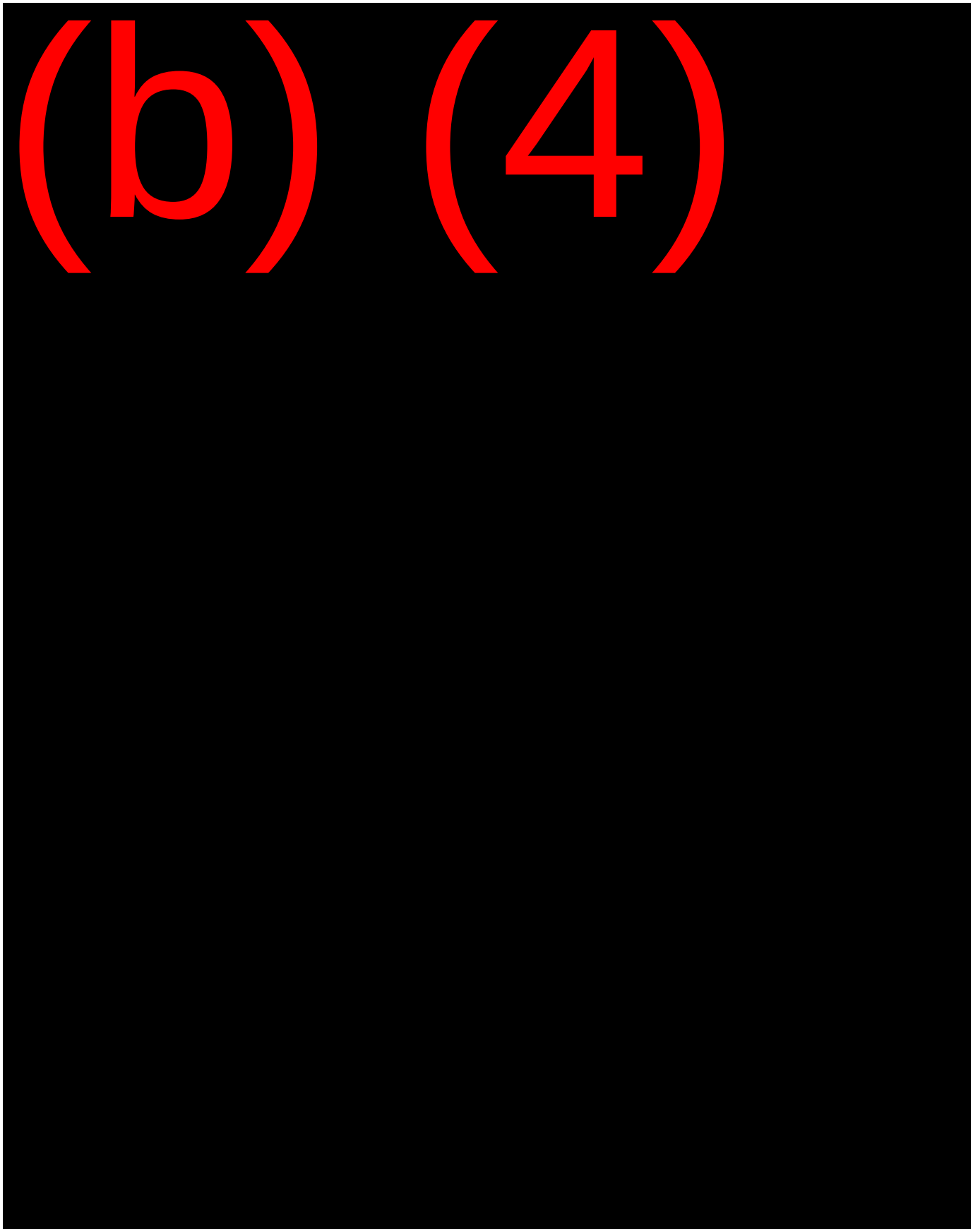
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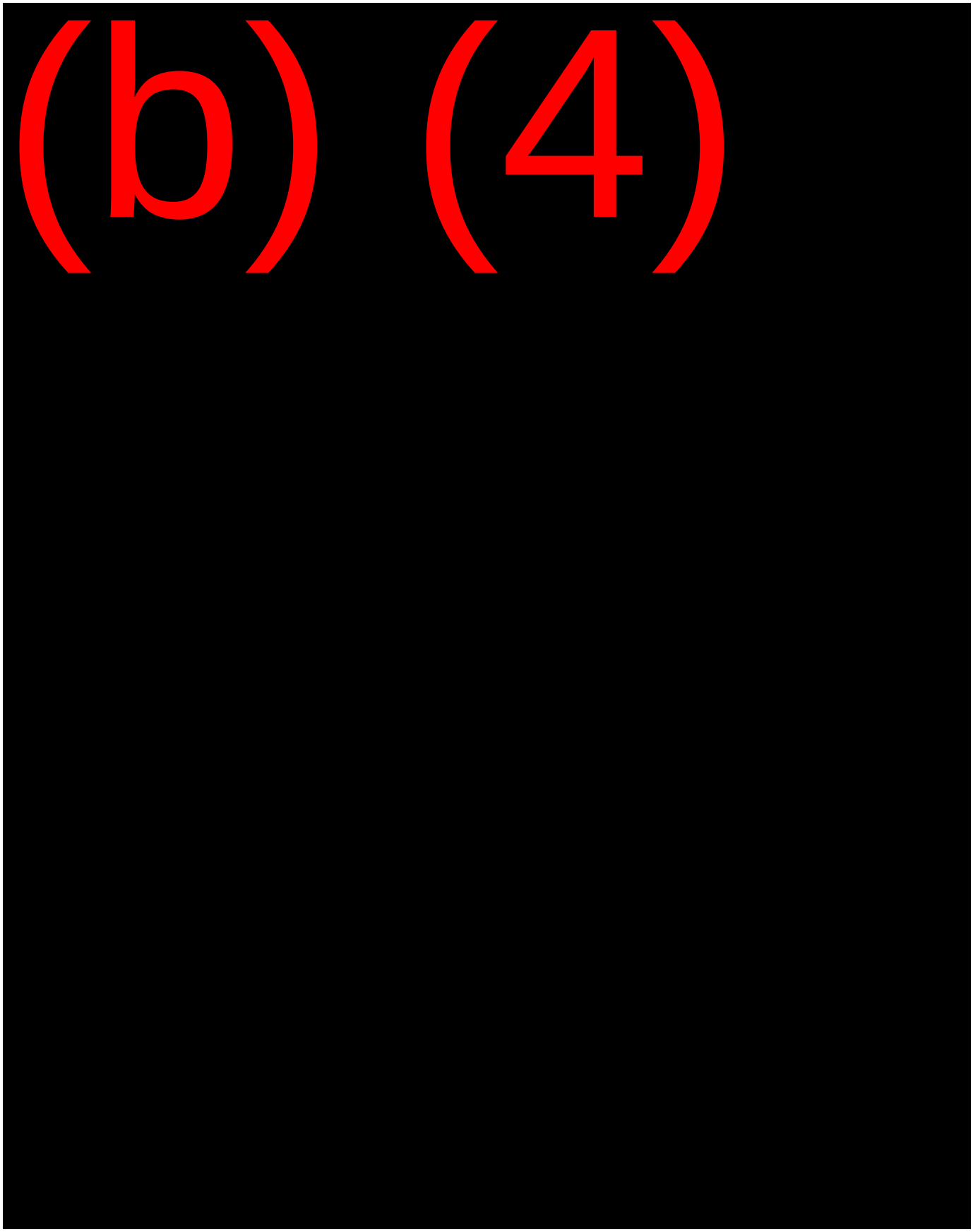
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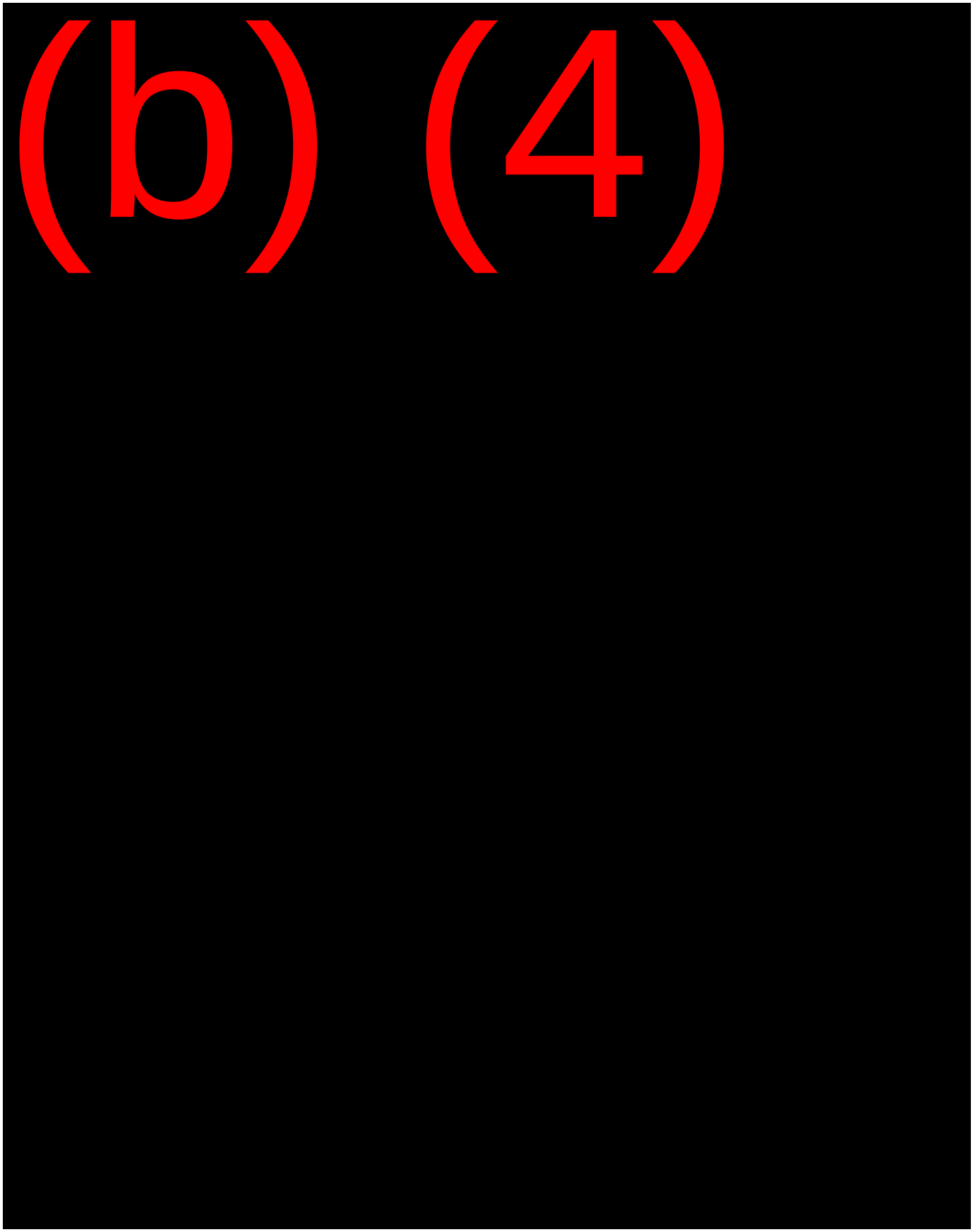
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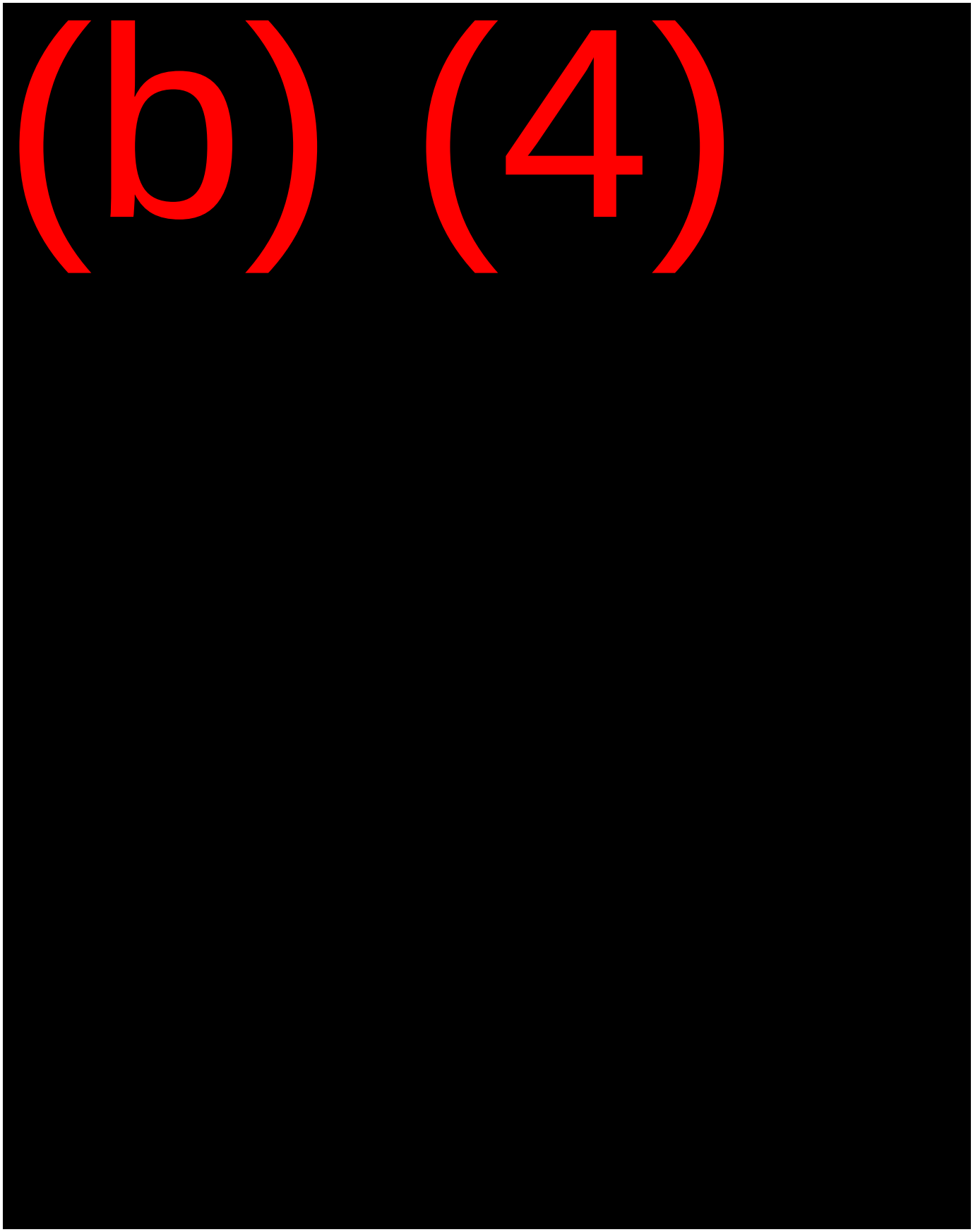
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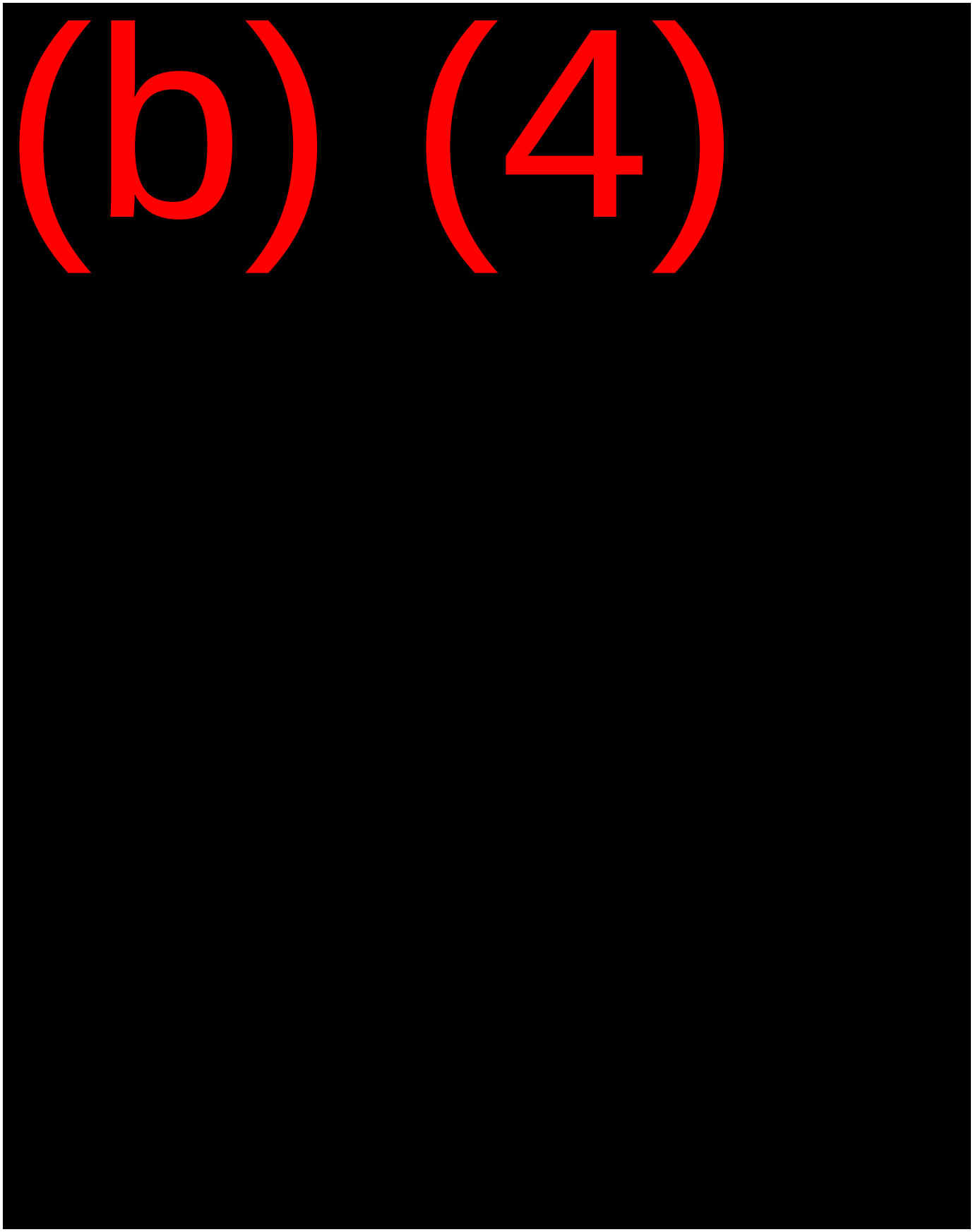
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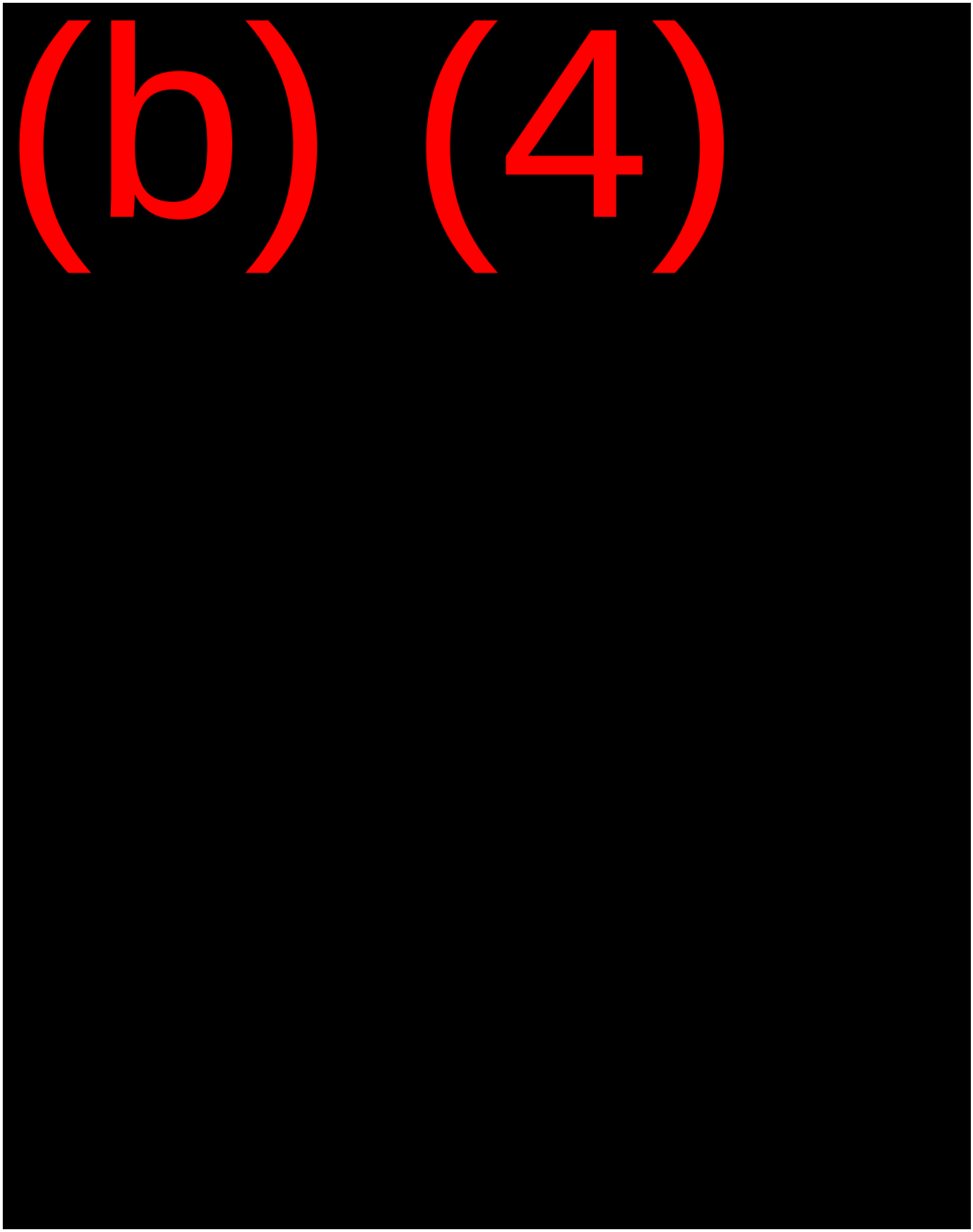
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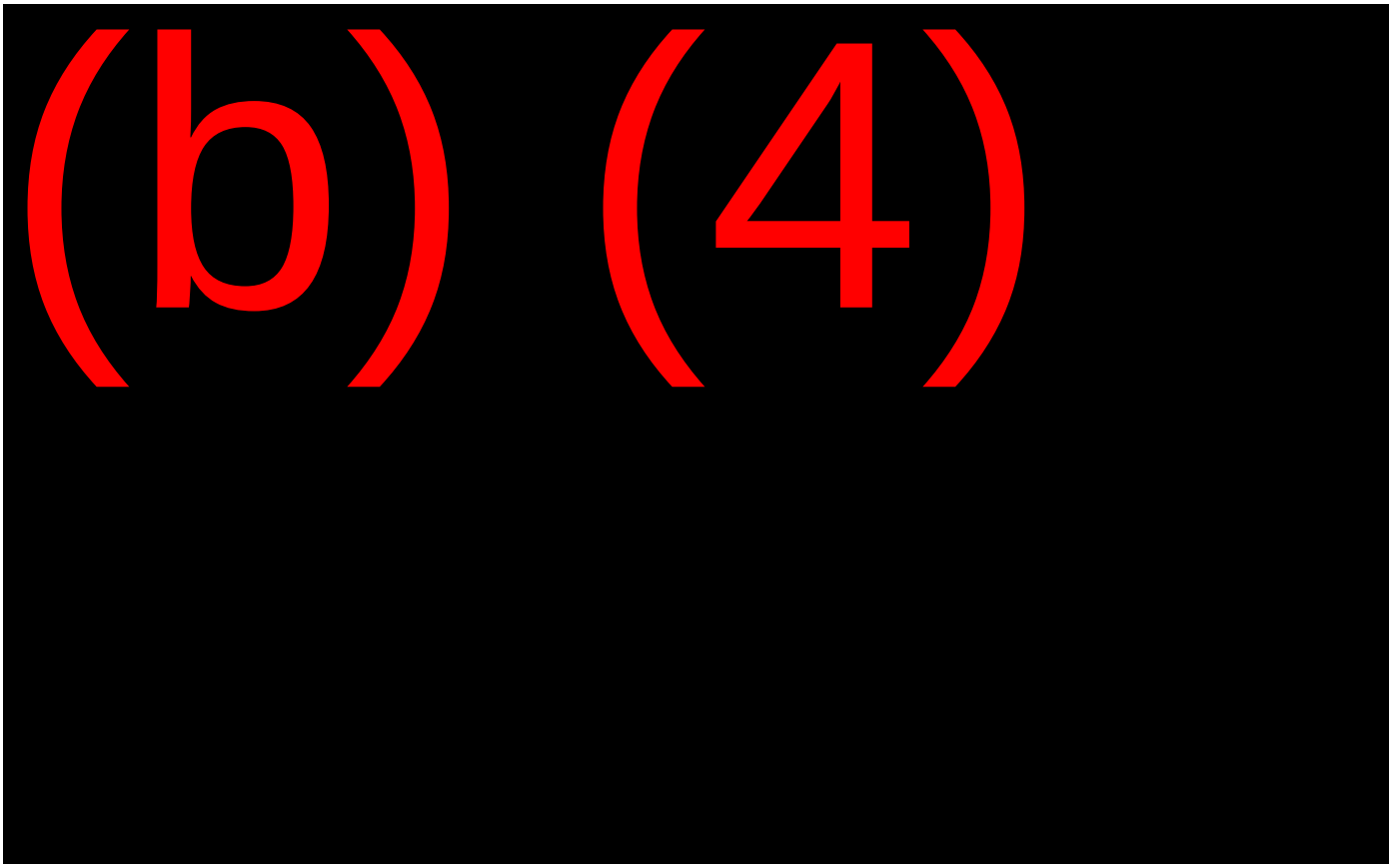
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